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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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78-1235. Grison, P. ; Martouret, D.; Servais, B.; Devriendt, M. (Stn. Zool. & Biocenotic For., INRA, 78000 Versailles, France) **Pesticides microbiens et environnement. [Pesticides and environment.]** *Ann. Zool. Ecol. Anim.* 8(2): 133-160; 1976. (48 references) (French)

Air and soil sampling methods were developed to determine the fate of entomopathogenic germs such as *Bacillus thuringiensis* introduced to control insect pests. During campaigns to protect forest stands from defoliating Lepidoptera, it was found that *B. thuringiensis* spores were carried in the air along a valley as far as 15 km from the emission point, and anabatic winds carried them over ridges more than 300 m above the upper limit of the scattering. The spores were so widely dispersed that they were no longer detectable in the air layer after two to three years; their accumulation was easier to detect in the top soil layers. The forest stands protected *B. thuringiensis* from UV solar radiation.

78-1236. Haley, T. J. (Natl. Cent. Toxicol. Res., FDA, Dep. HEW, Jefferson, AR 72079) **A review of the literature of rotenone 1,2,12,12a-tetra hydro- 8,9-dimethoxy- 2-(1-methylethenyl)- 1-benzopyrano[3,5-B] fuoro [2,3-h][1]benzopyran- 6(6h)-one** *J. Environ. Pathol. Toxicol.* 1(3): 315-337; 1978. (229 references)

Rotenone is extracted from the roots of various plants but may also produced synthetically by several methods. Rotenone can be determined colorimetrically, gravimetrically, spectrophotometrically, or by paper, thin-layer, gas, or liquid chromatography. Low concentrations of rotenone inhibit electron transfer at a specific site of the respiratory chain, although high concentrations inhibit electron transfer in more than one region. Rotenone inhibits contractions of isolated guinea pig atria and release and reuptake of norepinephrine in isolated splenic nerve granules. It also blocks mitochondrial oxidative phosphorylation, and suppresses Newcastle Disease and Herpes simplex viruses. Acute exposure to rotenone can be lethal to fish and mammals. Rats chronically ingesting rotenone show liver injury and suppressed growth. Rats have been maintained on high fat diets containing rotenone without organ damage or growth suppression. Rotenone inhibits cancer cells *in vitro* and has induced tumors in rats but not in mice. Neither of the tumor studies monitored the dietary rotenone content, although rotenone is degraded when exposed to light. The rotenone given to rats was contaminated with other rotenoids. Further lifetime studies with large groups of rodents are recommended.

78-1237. Finnegan, J. (Author address not given.) **A dangerous business: pesticide formulation.** *Job Safety Health* 6(4): 20-25; 1978. (2 references)

Possible hazards in the pesticide formulation industry are reviewed. Specific reference is made to Kepone exposure at Life Science Products, a Virginia company which formulated pesticides under blatently unsafe conditions. Pesticide formulation is a risky operation. Dangers come from the active agents, including organic phosphates, chlorinated hydrocarbons, carbamates, inorganic arsenics, mercurials, cyanides, coumarins, indandiones, organic acids, and derivatives. Some pesticides have been implicated as causes of cancer or leukemia. Some cause sterility in workers. Some are mutagenic and teratogenic. Several safety measures are briefly considered for use in the workplace.

78-1238. Bourne, W. R. P. (Dep. Zool., Univ. Aberdeen, Aberdeen AB9 2TN, Scotland) **The mass mortality of common murres in the Irish Sea in 1969.** *J. Wildl. Manage.* 40(4): 789-792; 1976. (35 references)

Instances, in which mass mortality to common murres have been noted are briefly reviewed with an attempt to analyze the data for common causes. In some birds toxic chemicals were found in the liver, including up to 9 ppm lead and arsenic, 5 ppm mercury, 90 ppm tin, 130 ppm zinc, 20 ppm copper, 3 ppm cadmium, 880 ppm PCB's, 25 ppm DDE, and 0.8 ppm dieldrin. Subsequent investigations have revealed local concentrations of heavy metals and PCB's in the Irish Sea and Firth of Clyde to the north. It is suggested that the murres commonly encounter a shortage of food in the late summer along the southern periphery of their range, causing them to eat in the more contaminated areas. The possibility that an elusive virus is the cause of the mass mortality episodes should also be examined.

78-1239. Metcalf, R. L. (Illinois Univ., Urbana-Champaign, IL) **Evaluation of a laboratory microcosm for study of toxic substances in the environment.** *Natl. Tech. Inform. Serv.* PB-252,982: 66p.; 1975. (17 references)

A simple model is described for ecosystem technology which can yield, at modest expense, a wealth of valuable information about pesticides, drugs, plasticizers, industrial chemicals, carcinogens, and trace metals. The value of laboratory microcosms in prescreening new chemicals at an early stage in their development; developing environmentally congenial products; tracing environmental fate and degradation pathways; studying toxicity and ecological problems; and establishing biodegradability indices and unextractable radioactivity are discussed. Included is a bibliography of published results from research papers and technical reports.

78-1240. Burruss, R. P., Jr. ; Sargent, D. H. (Versar, Inc., Springfield, VA 22151) **Technical and microeconomic analysis: arsenic and its compounds.** *Natl. Tech. Inform. Serv.* PB-253,980: 240p.; 1976. (159 references)

This document reports studies on the role of arsenic and arsenic compounds in the environment and in the economy of the United States. The need for and the projected effect of controlling the production, use, dissipation, and emission of arsenic and its compounds are considered. Occurrence in the environment, chemistry and toxicity of the compounds are reviewed. Arsenic occurs as an impurity in commercial raw materials, processors, and products. Sources of arsenic pollution are identified and characterized and health hazards are evaluated. There was no identifiable health hazard to the

amount of arsenic currently contained in food and water. Emissions to the air from high-temperature processes are large and particulate collection devices appear inadequate.

78-1241. Ballou, E. V. (NIOSH, Cincinnati, OH 45226) **NIOSH solid sorbents roundtable.** *Natl. Tech. Inform. Serv.* PB-266,449: 243p.; 1976.

The proceedings of a 2-day seminar on the topic of sorption of toxic substances on solids are outlined. The major concern of NIOSH is the applicability of these solid materials to the sampling of air contaminants in the workplace to assess chemical exposure of the American worker. Thirteen papers and a general discussion were presented at the conference. The characteristics of solid surfaces as they relate to sorption sampling were discussed in full. A variety of other topics were also presented, including the theoretical aspects of surface chemistry and sample retention performance, as well as the development of monitoring hardware, the use of fluidized bed concepts, the collection of high volumes, and the evaluation of a variety of sorbents for specific compounds. A roundtable discussion at the end of each presentation pointed out some of the applications of the research to field sampling.

78-1242. Fishbein, L. (Inst. Environ. Med., New York Univ., New York, NY 10003) **Potential impact of newer materials: noble metals, flame retardants, new pest-control strategies.** *Natl. Tech. Inform. Serv.* PB-273,229: 41p.; 1977. (59 references)

Platinum, palladium, and ruthenium are foremost among the noble metals whose catalytic uses are increasing rapidly. In all such uses, the amounts, physical and chemical forms of these elements, their fate, form and/or possible transformation within the atmosphere and ultimately within water and the food chain, as well as their toxicities, are presently largely unknown. The same is true for the chemical class of organic and inorganic compounds used as flame retardants, which are quite similar in behavior to the known persistent pesticides. In addition to the potential toxicity of these compounds to people using treated products, such compounds can be leached from fabrics during laundering and thereby be released into sewage. Because of the misuse or over-use of a number of the more persistent insecticides and the resulting environmental contamination, the author suggests a program of 'integrated control'. This approach would involve a coordinated use of all known methods of pest control and could significantly alter pesticide use patterns. (Author abstract by permission)

78-1243. Gray, E. ; Sherman, S.; Lindsay, A.; Talcott, F. (Off. Pestic. Programs, US EPA, Washington, DC 20460) **FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act): impact on the industry.** *Natl. Tech. Inform. Serv.* PB-265,453: 38p.; 1977.

The concern of Congress in relation to the regulations supported by the Federal Insecticide, Fungicide, and Rodenticide Act are outlined. The major impacts of the legislation since the 1972 amendments to date, especially those affecting the competitive atmosphere in the pesticide industry are discussed.

78-1244. Honea, F. I. (Midwest Res. Inst., Kansas City, MO 64110) **Pesticides industry.** *Natl. Tech. Inform. Serv.* PB-266,225: 240p.; 1977.

Industrial process profiles for environmental use was developed in order to aid in defining the environmental impact of industrial activity in the US. Entries for each industry form separate chapters in the book. Pesticides industry is listed as that industry which produces organic chemicals used to control agricultural pests, and to disinfect and condition the soil, as well as chemicals found in plant hormones. The inorganic chemicals, petroleum products, and creosote used as pesticides are not included. Topics discussed include: simple and aromatic chlorinated hydrocarbons; diene-based organophosphates; carbamates and thiocarbamates; triazines; anilides; ureas and uracils; nitrated hydrocarbons; other nitrogenous compounds; organoarsenicals and organometallics; and microbial and natural derivatives. For each of the 37 process descriptions discussed, available data is presented on input materials, operating parameters, utility requirements, and waste streams.

78-1245. Smith, E. H. ; Pimentel, D. (Cornell Univ., Ithaca, NY 14850) **Pest control strategies.** *Natl. Tech. Inform. Serv.* PB-274,644: 331p.; 1977.

Papers presented at a symposium held at Cornell University in June 1977 include the role of the USDA in integrated pest management, history and complexity of IPM, socioeconomic and legal aspects, obstacles and incentives, and case studies on alfalfa, deciduous tree fruits, potatoes, corn, and soybean. (Author abstract by permission)

78-1246. Anonymous. **Health and safety guide for pesticide formulators.** *Natl. Tech. Inform. Serv.* PB274,717: 121p.; 1977.

A guide intended to assist in providing a safe work place for pesticide formulators and workers in allied trades that share the same health and safety problems is described. Main topics covered include: health and safety guidelines, frequently violated regulations, occupational health and environmental control, ventilation, occupational noise exposure, contamination control, chemicals handling, hazardous materials, personal protective equipment, sanitation, medical and first aid, fire protection, materials handling and storage, machinery and machine guarding, welding, cutting, and brazing, and electrical requirements. (Modified author abstract by permission)

78-1247. Fairchild, E. J. (Tracor Jitco, Inc., Rockville, MD 20852) **Agricultural chemicals and pesticides; a subfile of the registry of toxic effects of chemical substances.** *Natl. Tech. Inform. Serv.* PB-274,748: 273p.; 1977.

This is the first edition of the subfile of agricultural chemicals and pesticides extracted from the NIOSH Registry of Toxic Effects of Chemical Substances. It contains 2190 substances that are used to achieve specific agricultural purposes. The subfile was prepared to provide toxicity data in order to facilitate the provision of a safe, healthful environment for employees encountering agricultural chemicals at all stages of testing, synthesis, formulation, and use. The subfile attempts to be a list comprehensive in scope rather than a status report on substances currently in use. Substances included are growth regulators, fertilizers, veterinary antibiotics, algicides, fungicides, herbicides, bactericides, disinfectants, insecticides, insecticide adjuvants, insect attractants and repellants, chemostirilants, acaricides, nematocides, molluscicides, avicides, and rodenticides. (Author abstract by permission)

78-1248. Constantine, D. G. (Calif. Dep. Health, Berkeley, CA 94704) **Bats, Rabies and DDT.** *N. Engl. J. Med.* 298(16): 915-916; 1978. (4 references)

This letter is one of several in a series, see *Pesticides Abstracts No. 77-2255*. The incidence of rabies in bats of North America has increased from 4.4% in 1961-1972 to 10.7% in 1976. It is suggested that this increase is caused by large sample sizes rather than an outbreak of rabies. The stressing of the outbreak may lead to public hysteria. If the increase is real, measures should be taken to destroy the bats and their harborages. DDT and other toxins are commonly used to destroy bats. Besides the use of toxins, other methods such as public caution in the handling of bats and minimization of encounters with bats are encouraged.

78-1249. De Castro, F. J. ; Jaeger, R. W. (St. Louis Reg. Poison Cent., Cardinal Glennon Mem. Hosp. Child., St. Louis Univ., St. Louis, MO 63104) **Pesticides.** *Paediatrician* 6(3-5): 250-261; 1977. (23 references)

The major pesticides are reviewed in this article by group including insecticides such as the chlorinated hydrocarbons, organophosphates and carbamates; rodenticides such as warfarin, as well as other miscellaneous pesticides. There are three major kinds of chlorinated hydrocarbon insecticides: DDT analogs, benzene hexachloride isomers, and cyclodiene compounds, and the chemical structure and activity varies with each group. Organophosphorus insecticides are usually able to form stable compounds with the enzyme acetylcholinesterase, causing the phosphorylated enzyme to loose its normal function as an esterase. Carbamate insecticides may act through an enzymatic carbamylation. For each of these three major types, information is provided on poisoning (both acute and chronic) and treatment of the same. Similar information is provided for sodium fluoroacetate, thallium, and warfarin. Some information is provided on pyrethrum, arsenicals, chlorbenzilate and chlorbenside as well as a few herbicides.

78-1250. Smith, R. J. (Author address not given) **Poisoned pot becomes burning issue in high places.** *Science* 200(4340): 417-418; 1978. (1 reference)

Paraquat, an herbicide used by the US to destroy Mexican marijuana crops, is being found in marijuana samples in concentrations up to 2264 ppm. Initially scientists said the burning of contaminated marijuana converted the paraquat to bypiridine, a common constituent in tobacco smoke. Later work has shown that as much as 5% of the paraquat remains unchanged, to be inhaled by the user. The inhalation of paraquat in amounts as little as three contaminated cigarettes a day may result in lung fibrosis which inhibits the ability to absorb oxygen. The scarring affects would build up slowly, ultimately causing the only probable symptom, extreme shortness of breath. Some officials of the US government are trying to halt the use of paraquat to protect the marijuana smoking population, while others are encouraging the use of the herbicide. The impact of the paraquat spraying program is still being evaluated.

78-1251. Off. Pestic. Programs, US EPA, Washington, DC **Principles of pesticide use, handling and application. Instructional modules for vocational agriculture education. Teacher manual.** *S/N 055-004-00012-9, US Govt. Print. Off., Washington, DC 20402* 421p.; 1976. (4 references)

This manual was designed as a teachers training program in the principles of pesticide use, handling and application. When used in conjunction with classroom teaching the module units give sufficient knowledge and skills for the student to obtain certification for private pesticide application in accordance with federal laws. Appended to the manual in full is the amended Federal Insecticide, Fungicide and Rodenticide Act.

78-1252. Murai, T. ; Igawa, H. (Natl. Inst. Agric. Sci., Kita-ku, Tokyo 114, Japan) **Photodecomposition of *S*-benzyl *O,O*- diisopropyl phosphorothiolate (Kitazin P).** *Agric. Biol. Chem.* 41(5): 803-809; 1977. (12 references)

Two main steps of photodecomposition were observed at the initial stage on the irradiation of ultraviolet light to Kitazin P in a thin film. One was the isomerization to a thionate, *O*-benzyl *O,O*-diisopropyl phosphonate and α-toluenethiol, the latter of which was degraded to produce α -toluene sulfonic acid via dibenzyl disulfide, and finally sulfuric acid and benzoic acid. *O,O*-Diisopropyl hydrogen phosphorothioate, *O,O*-diisopropyl hydrogen phosphate and benzyl alcohol were detected as hydrolysates. Benzyl alcohol was further oxidized to benzoic acid via benzaldehyde. In addition to these compounds, *O,O,S*-tri isopropyl phosphorothiolate, *O,O,O*-tri isopropyl phosphoro thionate, *O,O,O*- triisopropyl phosphate and benzyl isopropyl sulfide were also detected. (Author abstract by permission)

78-1253. Mallet, V. N. ; Volpe, Y. (Dep. Chem., Univ. Moncton, Moncton, NB, Canada) **Degradation of coumaphos in distilled water as a function of pH.** *Anal. Chim. Acta* 97(2): 415-418; 1978. (13 references)

Methods for the degradation and extraction of the organophosphorus pesticide, coumaphos, in distilled water were studied. Distilled water was adjusted to a pH of 4.0, 5.5, 6.3, 7.0, or 8.5 and then spiked with 60 μg of coumaphos. Aliquots were taken at 0, 24, 48, 72, and 96 hr after coumaphos spiking and the pH was readjusted to 5.5 for TLC and fluorimetric analysis. Results showed that coumaphos degrades at a first order rate in water to coroxon and then to chlorferone. Findings also indicate that coumaphos is more stable at neutral pH than it is in either acidic or basic water. Half-life studies showed that the disappearance of coumaphos in the reaction media could be attributed to the formation of coroxon and chlorferone.

78-1254. Agudo Valero, J. L. ; Barasona Mata, J.; Alcaide Megias, A.; Serrano Caballero, J. M.; Santiago Laguna, D.; Infante Miranda, F. (Sect. Zooecol. Environ. Toxicol., Inst. Zootect., Univ. Cordoba, Cordoba, Spain.) **Residuos de insecticidas organoclorados en ciervos (*Cervus elaphus*) y jabalies (*Sus scrofa baeticus*) capturados en la Sierra de Cordoba. [Residues of organochlorine insecticides in deer (*Cervus elaphus*) and wild boar (*Sus scrofa baeticus*) captured in the Sierra of Cordoba.]** *Arch. Zootec.* 24(95-96): 273-282; 1975. (6 references) (Spanish)

Serum samples from deer and wild boar shot in wooded area of Villaviosa and Cardena, Cordoba were analyzed for organochlorine residues. GC analysis indicated the presence of DDT, DDE, TDE, γ-BHC (lindane), heptachlor, aldrin, and dieldrin in concentrations between 0.0019 and 0.2239 ppm. One third of the samples contained no residues. Only DDT and DDE occurred consistently.

78-1255. Moody, R. P. ; Greenhalgh, R.; Lockhart, L.; Weinberger, P. (Dep. Biol., Univ. Ottawa, Ottawa, K1N 6N5, Ont., Canada) **The fate of fenitrothion in an aquatic ecosystem.** *Bull. Environ. Contam. Toxicol.* 19(1): 8-14; 1978. (11 references)

A study was conducted in June of 1975 at Pine Creek near Carberry, Manitoba to determine the fate of fenitrothion in stream water. Samples were taken following aerial deposition of an aqueous formulation of 10% fenitrothion, 1% Atlox 3409, 1% Aerotox 3470, and 88% water, at a rate of 4 oz/acre. The levels of fenitrothion were initially much greater in surface water samples than in subsurface samples, probably due to the slow mixing in stagnant water. Rainfall at 21, 38, 65, and 84 hr post spray could account for the fluctuating levels recorded at these sampling times. The relatively high level in the surface slick could be due to the affinity of fenitrothion for oily components present at the surface of the water. The surface dwelling duckweed received the initial fenitrothion deposit directly and the data also showed a rapid uptake of the pesticide during the initial 10 hr post spray. Subsequent rapid disappearance of fenitrothion may be the result of volatilization from exposed leaf surface as reported previously for conifer tissue, or due to biochemical and phytolytic degradation. Residues were found at relatively high levels for at least 92 hr in the submergent hornwort.

78-1256. Turner, J. C. (Dep. Zool. Physiol., Univ. Wyoming, Laramie, WY 82071) **Chlorinated hydrocarbon residues in perianal fat of desert bighorn sheep.** *Bull. Environ. Contam. Toxicol.* 19(1): 23-31; 1978. (27 references)

The objectives of this study were to determine the extent to which *o,p*-DDT, *p,p'*-DDT, *p,p'*-DDE, *p,p'*-DDD (TDE), PCB, aldrin, dieldrin, heptachlor, heptachlor epoxide and lindane are found in the perianal fat of two different races of desert bighorn sheep in Southern California deserts. All samples studied had chlorinated hydrocarbon residues. Only one sample had heptachlor and heptachlor epoxide above limits of detection and no samples had detectable amounts of aldrin in them. Dieldrin and lindane were found in 71% and 92% of the 24 samples analyzed, respectively, but comprised less than 14% of the total residue load per animal. DDT or its decomposition products were found in all analyzed fat samples. No significant relations were found between rams and ewes for any of the residue levels determined. Similarly, no age relations were noted except for DDE concentrations. PCB's were found in all samples and comprised an average of 69% of the total residue load per animal. Total residue levels showed no significant relationship with sex or age group.

78-1257. Wiemeyer, S. N. ; Swineford, D. M.; Spitzer, P. R.; McLain, P. D. (Patuxent Wildl. Res. Cent., US Fish. & Wildl. Serv., Laurel MD 20811) **Organochlorine residues in New Jersey osprey eggs.** *Bull. Environ. Contam. Toxicol.* 19(1): 56-63; 1978. (23 references)

Data is presented on levels of organochlorine pesticides and polychlorinated biphenyls in the eggs of New Jersey ospreys, the changes in eggshell thickness, and other information which may relate to similar data for declining and stable

osprey populations in other areas. Residues of the following chemicals were found: *p,p'*-DDE, *p,p'*-DDD (TDE), *p,p'*-DDT, dieldrin, heptachlor epoxide, mirex, chlordane, and PCB's. DDE was the predominant pollutant found, being present in all eggs examined at levels from 6.5 to 40 ppm. PCB's were also found in all eggs, as were residues of *p,p'*-DDD. The shells of eggs from the Barnegat Bay area in 1974 and the Avalon-Stone Harbor area were considerably thinner than shells of eggs collected before 1947 when the use of DDT was not widespread. The high residue levels of DDT and possibly the moderate levels PCB's in the New Jersey opsrey eggs appear to have been an important factor in the reduced rate of reproductive success for this population.

78-1258. Wiemeyer, S. N. ; Belisle, A. A.; Gramlich, F. J. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Laurel, MD 20811) **Organochlorine residues in potential food items of Maine bald eagles (*Haliaeetus leucocephalus*), 1966 and 1974.** *Bull. Environ. Contam. Toxicol.* 19(1): 64-72; 1978. (21 references)

Potential food for bald eagles, including Herring gulls and various types of fish, were collected in Maine and analyzed for pesticides. In 1966, the first year of the study, *p,p'*-DDE residues in fish from Washington County ranged from 0.11 ppm in yellow perch to 0.25 ppm in chain pickerel. *p,p'*-DDD residues ranged from undetectable levels in chain pickeral and sea herring to 0.06 ppm in common mackerel. *p,p'*-DDT residues ranged from undetectable levels in yellow perch to 0.33 ppm in common mackerel. In 1974, *p,p'*-DDE residues in fish from the same area ranged from undetectable levels in black bullhead, chain pickerel, and landlocked salmon to 0.10 ppm in fallfish. *p,p'*-DDD and *p,p'*-DDT were not detected. In 1966, *p,p'*-DDE residues in fish from Hancock County ranged from 0.08 ppm in common mackerel to 0.46 ppm in alewife. *p,p'*-DDD residues ranged from undetectable levels in sea herring and yellow perch to 0.08 ppm in alewife. *p,p'*-DDT residues ranged from undetectable levels in yellow perch to 0.50 ppm in alewife. In 1974, eels from the Penobscot River contained 0.05 ppm *p,p'*-DDE and no *p,p'*-DDD or *p,p'*-DDT. In 1966, *p,p'*-DDE residues in fish from Lincoln County ranged from undetectable levels in chain pickerel to 1.1 ppm in eel. *p,p'*-DDD residues ranged from undetectable levels in chain pickerel and sunfish to 0.27 ppm in eel. *p,p'*-DDT residues ranged from undetectable levels in yellow perch, chain pickerel, and sunfish to 0.60 ppm in eel. In 1974, *p,p'*-DDE residues in fish from the same area ranged from indetectable levels in white sucker and carp to 0.36 ppm in eel. *p,p'*-DDD residues ranged from undetectable levels in eel, white sucker, and carp to 0.10 ppm in white perch. *p,p'*-DDT residues ranged from undetectable levels in eel, white sucker, and carp to 0.24 ppm in white perch. In 1966 *p,p'*-DDE residues in Herring gulls ranged from 1.7 ppm to 5.9 ppm. *p,p'*-DDD residues ranged from undetectable levels to 0.23 ppm. *p,p'*-DDT residues ranged from undetectable levels to 0.32 to 0.32 ppm. Dieldrin residues ranged from 0.05 ppm to 0.24 ppm. Heptachlor epoxide residues ranged from undetectable levels to 0.17 ppm. Mirex residues ranged from undetectable levels to 0.19 ppm. Oxychlordane residues ranged from undetectable levels to 0.11 ppm. *cis*-Nonachlor residues ranged from undetectable levels to 0.07 ppm.

78-1259. Emanuelsen, M. ; Lincer, J. L.; Rifkin, E. (Mar. Lab., Texas A&M Univ., Galvesto ı, TX 77550) **The residue uptake and histology of American Oysters (*Crassostrea virginica* Gmelin) exposed to dieldrin.** *Bull. Environ. Contam. Toxicol.* 19(1): 121-129; 1978. (14 references)

Oysters were placed in water containing 0.1 ppm, 0.01 ppm, or 0.001 ppm dieldrin. After 10 days, the oysters exposed to 0.001 ppm contained 3.85 ppm dieldrin; those exposed to 0.01 ppm contained 15.7 ppm dieldrin, and those exposed to 0.1 ppm contained 22.3 ppm dieldrin. Oysters exposed to 0.1 ppm dieldrin for 15 days contained 289 ppm dieldrin. After 30 days exposure, the oysters exposed to 0.01 ppm contained 38.8 ppm dieldrin, and those exposed to 0.1 ppm contained 536 ppm dieldrin. After 48 days exposure, oysters exposed to 0.001 ppm contained 5.13 ppm dieldrin; those exposed to 0.01 ppm contained 55.0 ppm dieldrin, and those exposed to 0.1 ppm contained 537 ppm dieldrin. No significant morphological differences between oysters exposed to dieldrin and controls were observed.

78-1260. Siltanen, H. ; Rosenberg, C. (State Inst. Agric. Chem., SF-00171 Helsinki 17, Finland) **Analysis of 2,4-D and 2,4,5-T in lingonberries, wild mushrooms, birch and aspen foliage.** *Bull. Environ. Contam. Toxicol.* 19(2): 177-182; 1978. (10 references)

A method for analyzing lingonberries, wild mushrooms, and birch and aspen foliage for 2,4-D and 2,4,5-T was developed. The residues were extracted with diethyl ether, and the extracts were subjected to alkali hydrolysis. Column chromatography was used for purification. After methylation of the free acids, residues were determined by gas chromatography. Residues as small as 0.05 ppm 2,4-D and 0.02 ppm 2,4,5-T in a 20 g sample could be detected. Recovery ranged from 60% to 94%, and averaged 75%. The method was used to analyze lingonberries, wild mushrooms, and foliage exposed to aerial phenoxy herbicide spraying for brush control in northeastern Finland. Lingonberries contained 2,4-D residues ranging from less than 0.05 ppm to 7.0 ppm and 2,4,5-T residues ranging from 0.07 to 15 ppm. Wild mushrooms contained 2,4-D residues ranging from less than 0.05 ppm to 1.2 ppm and 2,4,5-T residues ranging from less than 0.02 ppm to 1.8 ppm. Foliage contained 2,4-D residues ranging from 0.15 ppm to 31 ppm and 2,4,5-T residues ranging from 0.1 ppm to 30 ppm.

78-1261. Kocher, C. W. ; Mahle, N. H.; Hummel, R. A.; Shadoff, L. A.; Getzendaner, M. E. (Anal. Lab., Dow Chem. Co., Midland, MI) **A search for the presence of 2,3,7,8 tetrachlorodibenzo- *p*-dioxin in beef fat.** *Bull. Environ. Contam. Toxicol.* 19(2): 229-236; 1978. (7 references)

A surveillance study was undertaken to determine if low level concentrations of TCDD could be detected in beef fat from cattle grazing on land where 2,4,5-T had been ap-

plied. Samples were taken at the Texas Department of Corrections Farm at Sugarland, Texas. This farm was spot sprayed in May, 1974 with a mixture of 1 gal of 2,4,5-T added to 100 gal of water. A clean-up procedure resulting in a 500-fold concentration was followed by GC-MS detection technique. The limit of detection of TCDD was in the 30-60 pg range. None of the 16 samples showed any response for TCDD. However, in a seprate study in which the animals were confined to a fenced pasture sprayed in its entirety with 2,4,5-T herbicide, samples from three of the seven animals gave a positive response at the extremely low level of 3 to 4 ppt TCDD, the lowest detectable limit.

78-1262. Fowler, S. W. ; Elder, D. L. (Int. Lab. Mar. Radioact., Musee Oceanogr., Monaco, Monaco) **PCB and DDT residues in a Mediterranean pelagic food chain.** *Bull. Environ. Contam. Toxicol.* 19(2): 244-249; 1978. (17 references)

Marine organisms collected off the coast of France were analyzed for DDT metabolites. Neither microplankton nor the water itself contained DDT metabolites. The microplanktonic euphausiid, *Meganyctiphanes norvegica*, contained 26 μg *p,p'*-DDE/kg. Decapod shrimp which prey upon this organism, *Sergestes arcticus* and *Pasiphaea sivado*, contained 15 and 5 μg *p,p'*-DDE/kg, respectively. The myctophid fish, *Myctophus glaciale*, which preys upon crustaceans, contained 1 μg *p,p'*-DDE/kg.

78-1263. Fleet, R. R. ; Plapp, F. W., Jr. (Sch. For., S.F. Austin State Univ., Nacogdoches, TX 75961) **DDT residues in snakes decline since DDT ban.** *Bull. Environ. Contam. Toxicol.* 19(4): 383-388; 1978. (10 references)

Snakes collected from a cotton agro-ecosystem on the floodplain of the Brazos River were frozen alive upon collection, and fat body tissue was exised for analysis of DDT and DDE content. The area was previously studied and was re-examined to establish the effect of the DDT ban on snakes. The area in 1971 was treated with a 4:2:1 combination of toxaphene:DDT: methyl parathion, while in 1974 to 1975, the common insecticide was a 2:1 ratio of toxaphene:methyl paration. Insecticide residues were determined using a Mirco-Tek Model 120 Gas Chromatograph using an Ni-63 detector according to standard methods. Seventy-six individuals were collected, of which six were oviparous. Organochlorines, particularly *p,p'*-DDT (0-14.6 ppm) and *p,p'*-DDE (6.2-596.6 ppm) were found in every sample. One sample contained a trace of dieldrin, and no samples contained DDD residues. Residues were usually higher in males. A 50% decline in the residues over the three years between studies indicate a rapid ecosystem recovery, although high residue levels indicate that a complete cleansing of the system will take many years.

78-1264. Greichus, Y. A. ; Greichus, A.; Draayer, H. A.; Marshall, B. (Chem. Dep., South Dakota State Univ., Brookings, SD 57006) **Insecticides, polychlorinated biphenyls and metals in African lake ecosystems. II. Lake McIlwaine, Rhodesia.** *Bull. Environ. Contam. Toxicol.* 19(4): 444-453; 1978. (21 references)

A study was made of insecticides, polychlorinated biphenyls and metals in an African lake ecosystem, the Lake McIlwaine area in Rhodesia. Insecticide residues most commonly found were DDT, DDD (TDE), DDE and dieldrin. Those not found in detectable amounts included lindane, heptachlor, heptachlor epoxide, aldrin, chlordane, endrin, methoxychlor, toxaphene, endosulfan, and Bayluside (clonitralid). Both insecticide and PCB levels increased with trophic levels in Lake McIlwaine. The levels of metals found were within ranges reported for some American lakes and rivers for water, bottom sediments, and plankton. Concentrations of metals in cormorant carcasses from Lake McIlwaine did not appear to be abnormal.

78-1265. Greichus, Y. A. ; Greichus, A.; Ammann, B. D.; Hopcraft, J. (Chem. Dep., South Dakota State Univ., Brookings, SD 57006) **Insecticides, polychlorinated biphenyls and metals in African lake ecosystems. III. Lake Nakuru, Kenya.** *Bull. Environ. Contam. Toxicol.* 19(4): 454-461; 1978. (7 references)

This paper presents the results of the last of four studies on the concentrations of insecticides, polychlorinated biphenyls, and metals in African lake ecosystems. No samples from the Lake Nakuru ecosystem had levels of lindane, heptachlor, heptachlor epoxide, aldrin, endrin, chlordane, endosulfan, methoxychlor, Bayluscide (clonitralid) or toxaphene above the minimum analytical levels for the methods used. The most prevalent residue was DDE followed by DDD (TDE), dieldrin, and DDT. No water or bottom sediment samples had any discernible insecticide residues except a sediment sample collected at the inlet of a sewer from the city of Nakuru. Plankton, chironomids, water boatmen and fish had residues of DDE and DDD. Only chironomids and water boatmen had levels of PCB's higher than the minimum analytical levels. In general, concentrations of insecticide residues and PCB's in the Lake Nakuru ecosystem do not appear to be a pollution problem at present. This may also be true for metals, but it is difficult to distinguish between naturally occurring concentrations and those introduced by man.

78-1266. McGregor, H. E. (US Grain Mark. Res. Lab., ARS, USDA, Manhattan, KS 66502) **Note on residues in flour resulting from malathion application in an operating mill.** *Cereal Chem.* 54(6): 1286-1287; 1977. (1 reference)

A study was conducted to determine what residues can be found in mill streams and finished flour when malathion is sprayed around milling equipment during normal mill operations. No malathion was found in any of the samples of tempered wheat (detection limit 0.06 ppm). The highest residue, 19.8 ppm, was found in purifier suction flour sampled 20 min after the application began. There was 2.2 ppm present 1.5 hr later. Patent flour contained 1 ppm when sampled 10 min after the beginning of the application. Three min after spraying ceased, the flour contained 1.4 ppm. At 1 hr

later, no residues were detected. The average malathion residue concentration in the patent flour during the 50 min sampling period was about 0.75 ppm. At present no malathion residue is allowed in flour to be consumed by humans.

78-1267. Bertling, L. ; Delventhal, J.; Tietz, I. (Chem. Res. Inst. Wuppertal & Solingen, Wuppertal, Germany) **Bestimmung von Diphenyl und o-Phenylphenol in Zitrusfruechten. [Determination of diphenyl and *o*-phenylphenol in citrus fruits.]** *Dtsch. Lebensm. Rundsch.* 74(2): 41-42; 1978. (33 references) (German)

A GC method for determining diphenyl and *o*-phenylphenol in citrus fruit peel is described. Following extraction with acetone-dichloromethane mixture, the filtered extracts are injected into the Sweep-Codistiller, after which the extract is cleaned up on small florisil columns. Extracts from lemon peel require additional cleanup on alumina column for the determination of diphenyl. GC determination is done by means of a flame-ionization detector at an injection temperature of 250°C, using nitrogen as the carrier gas and columns filled with 10% DC 200/15% QF (1:1) on Gaschrom (80-100 mesh) and with 3% QF on Gaschrom Q (100-120 mesh).

78-1268. Cole, L. K. ; Sanborn, J. R.; Metcalf, R. L. (Inst. Environ. Stud., Univ. Illinois, Urbana, IL 61801) **Inhibition of corn growth by aldrin and the insecticide's fate in the soil, air, crop and wildlife of a terrestrial model ecosystem.** *Environ. Entomol.* 5(3): 583-589; 1976. (17 references)

The subsurface application of aldrin to the vermiculite substrate of a terrestrial model ecosystem resulted in a 9.5% reduction in the plant height of corn (*Zea mays*, 'Rieds Yellow Dent Synthetic') at 2 wk postplanting when the application rate simulated 1 lb AI/acre (or 2.24 kg/ha). Similar results occurred in greenhouse studies using Drummer loam soil and commercially formulated aldrin. A simulated 1 lb AI/acre application of ^{14}C-aldrin produced an initial concentration in vermiculite of 2.24 ppm, which decreased to 0.622 ppm of total residue after 20 days. Simultaneously, aldrin products were released into the atmosphere. Most of the volatilization occurred during the initial 5 days, and the vapor density progressively decreased with time. The corn acquired a pesticide residue of 2.85 ppm after 2 wk of growth; 78% of the residue was in the roots and 22% was in the shoots. The major ^{14}C-compounds detected in the roots were aldrin and dieldrin, but neither of these compounds was the major ^{14}C-metabolite in the aerial portion of the crop. The pesticide residues detected in the entire vole, *Microtus ochrogaster*, which fed at will in the ecosystem during the terminal 5 days of the experiment, was 3.81 ppm; the concentration within its mammary glands was 20.2 ppm, 99.0% of which was dieldrin. The system appears useful for screening the potential environmental impacts of pesticides. (Author abstract by permission)

78-1269. Dawson, R. ; Riley, J. P. (Dep. Oceanogr., Univ. Liverpool, Liverpool L69 3BX, England) **Chlorine-containing pesticides and polychlorinated biphenyls in British coastal waters.** *Estuarine Coastal Mar. Sci.* 5(1): 55-69; 1977. (27 references)

Gas chromatography was used to determine pesticide residues in samples from the Irish Sea, the Firth of Clyde, northern Scottish coastal waters, the English Channel, and North Sea. Total DDT in water samples from the Irish Sea ranged from 0.25 ng/l to levels below 0.01 ng/l, (too small to be detected). Dieldrin levels ranged from 0.30 ng/l to undetectable levels. Total DDT in water samples from the Firth of Clyde ranged from 0.05 ng/l to 0.02 ng/l. Dieldrin levels ranged from 0.03 ng/l to undetectable levels. Total DDT in water samples from the English Channel ranged from 0.03 ng/l to undetectable levels. Dieldrin levels ranged from 0.01 ng/l to undetectable levels. Dieldrin was not detected in Scottish coastal waters. Total DDT levels of 0.02 and 0.04 ng/l were found in water samples from the North Sea. Dieldrin levels in the North Sea did not exceed 0.01 ng/l. Organic, rich, clay sediments from the Irish Sea contained 0.6 to 1.8 ng/g total DDT. These sediments contained dieldrin levels ranging from 0.7 ng/g to undetectable. Sand and shell sediments contained total DDT levels ranging from 0.2 ng/g to undetectable, and did not contain dieldrin. Total DDT levels in particulates from the Irish Sea ranged from 20 ng/g to undetectable levels. Dieldrin levels in these particulates ranged from 140 ng/g to undetectable levels.

78-1270. Mirna, A. (Bundesanst Fleischforsch. D-8650 Kulmbach, Germany) **Moeglichkeiten und Grenzen der routinemaessigen Erfassung von Rueckstaenden in Fleisch und Fleischerzeugnissen. [Routine detection and determination of residues in meat and meat products.]** *Fleischwirtschaft* 56(3): 352-355; 1976. (German)

Some problems of the routine determination of residues and trace elements in meat and meat products are discussed. Sodium chloride added to meat and meat products tends to reduce the rate of extraction of DDT and lindane compared with similar products to which nitrite, sodium ascorbate or both are added. This may be due to the blockade by nitrite of the functional groups (e.g., SH groups) of the proteins which bind the pesticides. In view of the high expenses and time requirements for residue analysis in meat and meat products, analyses for carcinogenic, mutagenic, hormone-active, persitent and accumulating substances should have priority.

78-1271. Arrifai, K. ; Acker, L. (Author address not given) **Zur Kontamination des Getreides durch polychlorierte Biphenyle und Hexachlorbenzol. [Contamination of cereals by polychlorinated biphenyls and hexachlorobenzene.]** *Getreide Mehl Brot.* 29(9): 240-243; 1975. (14 references) (German)

The possible route of contamination of cereals and meal with polychlorinated biphenyls (PCB's), and the results of PCB and hexachlorobenzene residues analyses in cereals grown in West Germany are presented. The PCB uptake from air and soil is assumed to be negligible, but considerable

amounts may be taken up during storage from PCB-containing paint in silos and processing equipment through direct contact and vapor phase reactions. Packaging materials made from recycled paper are another source of contamination. The GC analysis of 136 cereal samples from the 1972-1974 harvests revealed mean residue levels of 0.006-0.03 ppm, with concentrations between 0.01 and 0.13 ppm in 76 samples. The levels found in the different years showed no trend. One hundred forty-six samples were analyzed for hexachlorobenzene; the mean residue levels ranged from 0.001 to 0.082 ppm. The residue levels exceeded 0.01 ppm in 12 of 24 samples from the 1972 harvest, but the residue level was below this limit in all 20 samples from the 1974 harvest, which might be indicative of a favorable trend.

78-1272. Vladimirova, L. G. ; Ledenkova, T. P. (Magarach All-Union Sci. Res. Inst. Ecol. Vitic., Yalta, USSR) **Kontrol' za soderzhaniem malykh kolichestv. CS_2 v vinograde i produktakh ego pererabotki. [Determining small amounts of CS_2 in grapes and grape products.]** *Gig. Sanit.* (2): 73-75; 1978. (Russian)

A method for determining carbon disulfide in grape juice and wine is described. CS_2 is enriched by frontal absorption in a pre-evacuated column, using zeolite CaA as adsorbent (pore size 5 A). Carbon disulfide is determined gas chromatographically with a thermoionic detector, using helium as carrier gas. The evaporator temperature is 150°C. Polysorb-1 is used as sorbent. The method, which is suitable for the determination of CS_2 in practically any liquid, has a sensitivity of 0.12 mg/l and a reproducibility of ±5%. One analysis (including the evacuation) takes up to 15 min.

78-1273. Bolotnyy, A. V. ; Sova, R. E.; Akoronko, S. L.; Asriev, E. A.; Yanover, S. B.; Naumenko, N. F. (All-Union Sci. Res. Inst. Pestic. Polymers & Plastic Mater., Kiev, USSR) **Gigienicheskaya otsenka primeneniya serouglerodnoi emul'sii pri obrabotke vinogradnikov. [Hygienic assessment of carbon disulfide emulsion used in vineyards.]** *Gig Sanit.* (2): 105-107; 1978. (Russian)

The hygienic assessment of carbon disulfide (CS_2) emulsion, a mixture of 50% CS_2 with 25% urea, 24.5% water and 0.5% emulsifier, which is used for soil fumigation in vineyards for controlling phylloxera, is presented. The soil was fumigated at 30-35 cm depth at an expenditure of 300-400 kg/ha CS_2. No carbon disulfide was detectable in the top soil layer after 2 days, and in the deeper layers 6 days after fumigation. Fumigation caused slight, transient increases in the populations of various types of soil microorganisms, but no effect was seen 6 to 12 mo after treatment. The CS_2 concentrations measured at 100 and 300 m distances from the fumigated vineyard were 0.30 and 0.038 mg/m^3, respectively. CS_2 was found in the air over the fumigated vineyard in a concentration of 0.0020 mg/m^3 two days after fumigation, but it was not detectable on the third day. Carbon disulfide was not found in leaves and grapes sampled 5 to 90 days after fumigation. The findings indicate that fumigation with carbon disulfide is acceptable hygienically, but a sanitary protection zone of 500 m around the vineyard being fumigated is recommended. Work may be resumed in the vineyards 3 days after fumigation.

78-1274. Ghezzo, F. ; Zampetti, F.; Zappatore, U. (Inst. Hyg., Catholic Univ., Rome, Italy) **Il significato della paraoxonasi ematica nel controllo della esposizione ad organofosforici. [On the significance of blood paraoxonase in the control of exposure to organophosphorus compounds.]** *Ig. Mod.* 70(6): 547-552; 1977. (29 references) (Italian)

Studies on the relevance of serum paraoxonase determination in subjects exposed to organophosphorus compounds are reviewed, and preliminary results of a recent investigation are presented. The serum paraoxonase activity was determined according to Krisch in scores of farm and industrial workers exposed to such organophosphorus compounds as parathion and methylparathion. The paraoxonase levels varied within a fairly wide range from 16 to 93.1 μ/l and the arithmetic mean found after logarithmic transformation was 51.05 μ/l at a standard deviation of 1.58 and a variability coefficient of 3%. The dynamic changes of the serum paraoxonase levels are being studied in individual subjects. The serum paraoxonase test may be combined with cholinesterase tests in the diagnosis of poisoning with organophosphorus pesticides.

78-1275. Spear, R. C. ; Lee, Y. S.; Leffingwell, J. T.; Jenkins, D. (Dep. Biomed. Environ. Health, Sci. & Sanit. Eng. Res. Lab., Univ. California, Berkeley, CA 94720) **Conversion of parathion to paraoxon in foliar residues: effects of dust level and ozone concentration.** *J. Agric. Food Chem.* 26(2): 434-436; 1978. (9 references)

The effects of foliar dust and atmospheric oxidant concentrations on paraoxon residue levels in chamber experiments were studied. Dwarf Eureka lemon trees were treated with parathion and placed in an environmental chamber for 4 days. At low levels of foliar dust, little paraoxon was produced, regardless of ozone concentration. Paraoxon production was increased by a factor of 4 at high dust levels without ozone and by a factor of nearly 30 at high dust levels in the presence of 300 ppm ozone. These results indicate that foliar dust levels are a primary determinant of paraoxon production in foliar residues of parathion in the laboratory setting. Several of the areas, especially the sites of residue poisoning in California, are known to be troubled by both particulate and oxidant air pollutants.

78-1276. Popendorf, W. J. ; Leffingwell, J. T. (Dep. Biomed. & Environ. Health Sci., Sch. Public Health, Univ. Calif., Berkeley, CA 94720) **Natural variations in the decay and oxidation of parathion foliar residues.** *J. Agric. Food Chem.* 26(2): 437-441; 1978. (17 references)

These studies were undertaken to investigate the effect of certain factors, such as weather, on paraoxon production. The studies were made in 17 central California orange groves. A first-order kinetic decay model for both parathion

and paraoxon was used. Paraoxon yield from parathion decay averaged about 47% for the first three days, then dropped to near 0.7% thereafter. During the early phase, oxidation was increased when zinc sulfate was included in the application. Residue oxidation and decay correlated strongly with dry, stable weather conditions, implying that worker posioning incidents in 1975 may have been associated with foliar dust and airborn oxidants.

78-1277. Ross, R. ; Morrison, J.; Fine, D. H. (Thermo Electron Res. Cent., Waltham, MA 02154) **Assessment of dipropyl nitrosamine levels in a tomato field following application of Treflan EC.** *J. Agric. Food Chem.* 26(2): 455-457; 1978. (19 references)

An examination of possible human exposure to dipropyl nitrosamine resulting from application of a formulation containing 154 ppm (w/w) NDPA was carried out. The study field was devoted to tomato cultivation with row irrigation. After the last manual cultivation the field was treated with the preparation, Treflan EC (trifluralin), by soil incorporation. Treatment was completed over a 2 day period. After treatment the field was plowed for row irrigation. Four days after Treflan EC treatment, irrigation was initiated. Treflan had been applied to the field the previous two years. No residues of N-nitroso propylamine were detected in the anlayses. Applicaton of a general screening procedure for N-nitroso compounds in the irrigation water revealed no evidence for the presence of *N*-nitroso compounds in the water due to use of the N-nitroso amine- contaminated herbicide formulation.

78-1278. Kadoum, A. M. ; Alnaji, L. (Dep. Entomol., Kansas State Univ., Manhattan, KS 66506) **Effect of grain moisture content on the degradation rate of methyl phoxim in corn, sorghum, and wheat.** *J. Agric. Food Chem.* 26(2): 507-509; 1978. (10 references)

The effect of grain moisture content on the degradation rate of methyl phoxim in corn, sorghum, and wheat was investigated. Eight levels of moisture were used, following 10 ppm applications of methyl phoxim emulsion spray. High moisture reduced the effectiveness and persistence of methyl phoxim in stored grain. Degradation differed significantly at each moisture level. After 30 days of storage, 10, 3, and 22.9% of the initial residue deposit remained on the 20% moisture sorghum, wheat, and corn, respectively. The highest residue deposits remained in the 6% grain moisture levels. After 30 days of storage, 71, 63, and 68% of the initial residue deposit remained on sorghum, wheat, and corn, respectively.

78-1279. Bovey, R. W. ; Richardson, C.; Burnett, E.; Merkle, M. G.; Meyer, R. E. (Dep. Soil Crop Sci., Texas A&M Univ., College Station, TX 77843) **Loss of spray and pelleted picloram in surface runoff water.** *J. Environ. Qual.* 7(2): 178-180; 1978. (9 references)

This investigation was conducted to determine the concentration of picloram (4-amino-3,5,6- trichloro picolinic acid), applied as the pelleted formulation, in surface runoff water that may move from a treated watershed to untreated areas as a result of natural or simulated rainfall. Movement of surface and subsurface applied picloram in surface runoff water was also investigated. The potassium salt of pelleted picloram was applied at 2.24 kg/ha (acid equivalent) to a 1.3 ha rangeland watershed supporting stands of honey mosquite (*Prosopis juliflora* [Swartz] DC. var. *glandulosa* [Torr.] Cockerell). Surface runoff of 1.5 cm from a 2.1 cm rain received 2 days after treatment contained an average of 2.8 ppm picloram. Picloram content declined rapidly and runoff water contained < 5 ppm picloram by 2.5 mo after application. Loss of the potassium salt of picloram from grassland watersheds in surface runoff water was similar, whether the picloram was applied as an aqueous spray or pellet. Picloram applied subsurface was lost in surface runoff water, but in lower concentration than when applied to the soil surface. (Author abstract by permission)

78-1280. Bovey, R. W. ; Burnett, E.; Meyer, R. E.; Richardson, C.; Loh, A. (ARS, USDA, College Station, TX 77843) **Persistence of tebuthiuron in surface runoff water, soil, and vegetation in the Texas Blacklands Prairie.** *J. Environ. Qual.* 7(2): 233-236; 1978. (12 references)

The concentration of tebuthiuron (*N*-[5-(1,1- dimethylethyl)- 1,3,4-thiadiazol- 2-yl-*N,N'*- dimethylurea) applied in the spray or pellet form was measured in surface runoff water from watersheds which received natural or simulated rainfall. The persistence of tebuthiuron in soil and vegetation was also investigated. Pelleted tebuthiuron was applied at 2.24 kg/ha (active ingredient) to a 1.3 ha rangeland watershed. A 2.8 cm rain, 2 days after application, produced 0.94 cm runoff which contained an average of 2.2 ppm of tebuthiuron. Tebuthiuron concentration decreased rapidly with each subsequent runoff event and after 3 mo was < 0.05 ppm; none was detected in runoff water 1 yr after treatment. The concentration of tebuthiuron, applied as a spray at 1.12 kg/kg, decreased to < 0.01 ppm within 4 mo in runoff from a small plot which recieved simulated rainfall. On 0.6-ha plots, mean tebuthiuron (sprays and granules) concentration was 0.50 ppm or less in water when the first runoff event occurred 2 mo after application. Concentrations of tebuthiuron in soil and grass from pellet applications were low (< 1 ppm) and decreased with time. (Author abstract by permission)

78-1281. Karickhoff, S. W. ; Brown, D. S. (Environ. Res. Lab., US EPA, Athens, GA 30605) **Paraquat sorption as a function of particle size in natural sediments.** *J. Environ. Qual.* 7(2): 246-252; 1978. (13 references)

The distribution of sorbed paraquat (1,1'- dimethyl-4,4'- bypyiridinium ion) as a function of particle size (sand through clay) was determined on five natural sediments. Paraquat concentrations in individual size fractions varied by as much as two orders of magnitude within a given sediment, showing a pronounced preference for the fine silt and clay fractions. Adsorption isotherms were measured for individual size separates on one sediment. Paraquat distributions in the whole sediment agreed well with those computed using

the isotherm coefficients determined on individual size separates. Paraquat sorbs by ion exchange, and sorption partition coefficients showed a definite correlation with the cation exchange capacity (CEC) of individual size fractions. However, exchange sites in different fractions differed in their effectiveness in sorbing paraquat, with the fine silt and clay exchange sites being more effective than those of the large separates. In pure clay suspensions (hectorite and montmorillonite), sorbed paraquat did not distribute uniformly throughout the clay particle size range. The concentration peaked in the mid-size range (0.065-0.44 μm, equivalent Stokes radii) and decreased uniformly in the large and smaller particle size. Peak concentrations were two to five times those of the less sorbing components. Because no corresponding trend was found in NH_4-measured CEC's, exchange sites in the median clay particle size ranges seemed to be more "effective" in sorbing paraquat than the extreme size ranges. UV spectra of paraquat in a hectorite suspension revealed that, after 4 hr of centrifuging at 20,000 rpm, > 50% of the paraquat remaining in the suspended (water) phase was sorbed on particulates not removed by centrifugation. Therefore, for highly sorbed compounds such as paraquat, conventional phase separation techniques for measuring sorption may not distinguish sorbed vs "free" compounds. (Author abstract by permission)

78-1282. Wilson, R. G., Jr. ; Cheng, H. H.* (Dep. Agron. & Soils, Washington State Univ., Pullman, WA 99163) **Fate of 2,4-D in a Naff silt loam soil.** *J. Environ. Qual.* 7(2): 281-286; 1978. (16 references)

Laboratory studies were conducted to determine the adsorption, desorption, hydrolysis, and breakdown of commercially formulated iso-octyl ester and dimethylamine salt of 2,4-D [(2,4- dichlorophenoxy) acetic acid] in a Naff silt loam soil. More 2,4-D was adsorbed to the surface soil than to soil at lower depth, and the percentage of 2,4-D adsorbed depreased as the total amount of 2,4-D present increased. Adsorbed 2,4-D was gradually desorbed from soil by successively exchanging the solution in equilibrium with soil distilled water. Formulated 2,4-D iso-octyl ester applied to moist soil underwent hydrolysis to the anionic form at a rapid rate, with > 80% of the ester hydrolyzed in 72 hr. High amounts of 2,4-D in runoff (sediment and water) retarded the active degradation of ^{14}C-carboxyl 2,4-D when 2,4-D was incubated in runoff from a wheat field treated with various formulations and rates of 2,4-D. The presence of the ester formulation at the high rate of application increased the lag period before degradation of ^{14}C-carboxyl and ^{14}C-ring 2,4-D occurred in soil. However, once the active breakdown of ^{14}C-carboxyl and ^{14}C-ring 2,4-D was initiated, little difference could be detected in the degradation patterns. At the end of the 10 wk incubation in runoff or in soil, only 1% of the ^{14}C-2,4-D originally applied to the soil could be identified as 2,4-D. (Author abstract by permission)

78-1283. Addison, R. F. ; Zinck, M. E.; Ackman, R. G.; Sipos, J. C. (Mar. Ecol. Lab., Fish. Mar. Serv., Dep. Fish. Environ., Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada) **Behavior of DDT, polychlorinated biphenyls (PCBs), and dieldrin at various stages of refining of marine oils for edible use.** *J. Am. Oil Chem. Soc.* 55(4): 391-394; 1978. (24 references)

Two batches of herring oil were processed to margarine stock. Before processing, the first batch of oil contained 0.67 ppm *p,p'*-DDE, 0.41 ppm *p,p'*-DDD (TDE), 0.36 ppm *p,p'*-DDT, and 0.15 ppm dieldrin. Phosphoric acid washing, alkali refining, and bleaching had little effect on these concentrations. After hydrogenation to IV 118, only 37% of the *p,p'*-DDD remained, and *p,p'*-DDT and dieldrin were not detected. After hydrogenation to IV 90, 81% of the *p,p'*-DDE and 27% of the *p,p'*-DDD remained. Only 37% of the *p,p'*-DDE and 16% of the *p,p'*-DDD remained after hydrogenation to IV 79. No residues were detected after deodorization. Before hydrogenation, the second batch of oil contained 0.59 ppm *p,p'*-DDE, 0.44 ppm *p,p'*-DDD, 0.60 ppm *p,p'*-DDT, and 0.13 ppm dieldrin. After hydrogenation to IV 105, only 81% of the *p,p'*-DDE remained, and neither *p,p'*-DDE, *p,p'*-DDT, nor dieldrin was detected. Hydrogenation to IV 91 and IV 80 reduced *p,p'*-DDE levels to 71% and 31%, respectively, of the initial residue. The hydrogenation catalyst, which contained no detectable residues before use with this batch of oil, contained only 0.28 ppm lipid of *p,p'*-DDE after hydrogenation. The only pesticide residue in the deodorized condensates was 0.36 ppm lipid of *p,p'*-DDE.

78-1284. Stendell, R. C. ; Cromartie, E.; Wiemeyer, S. N.; Longcore, J. R. (Patuxent Wildl. Res. Cent., US Fish Wildl. Serv., Laurel, MD 20811) **Organochlorine and mercury residues in canvasback duck eggs, 1972-73.** *J. Wildl. Manage.* 41(3): 453-457; 1977. (23 references)

Eggs of canvasback ducks (*Aythya valisneria*) from several major breeding areas were analyzed for organochlorine and mercury residues. Polychlorinated biphenyls (PCB's) were detected in 96 of 97 eggs, in concentrations up to 29 ppm (wet weight). DDE occurred in 79 percent of the samples with a maximum residue of 12 ppm (w.w.). DDT, DDD, dieldrin, hexachlorobenzene, *cis*-chlordane, heptachlor epoxide, and oxychlordane were detected less frequently. Mercury was detected in only 6 of 34 eggs analyzed. Most of the eggs contained concentrations of organochlorines and mercury below levels known to cause adverse effects on avian survival or reproduction. (Author abstract by permission)

78-1285. Wharfe, J. R. ; van der Broek, W. L. F. (Sir John Cass Sch. Sci. Tech., City London Polytech., London El, England) **Chlorinated hydrocarbons in macroinvertebrates and fish from the Lower Medway Estuary, Kent.** *Mar. Pollut. Bull.* 9(3): 76-79; 1978. (22 references)

Macroinvertebrates and fish were collected from the Lower Medway Estuary, Kent, England and analyzed for organochlorine pesticides and other substances. The pesticides found in quantifiable amounts were DDT and its metabolites and dieldrin. Average levels of DDT and metabolites in periwinkles ranged from 1.0 to 6.3 ng/g (wet weight), in shore crabs from 4.8 to 25.7 ng/g, in mussels from 11.0

to 71.8 ng/g, and averaged 0.9 ng/g in ragworms and 18.7 ng/g in shrimp. Average levels of dieldrin in periwinkles ranged from 0.1 to 1.6 ng/g, in shore crabs from 0.8 to 10.7 ng/g, in mussels from 4.0 to 11.1 ng/g, and averaged 3.0 ng/g in ragworms and 5.5 ng/g in shrimp. Average DDT levels in eels ranged from 96.9 ng/g (w. w.), in liver of eels over 30.0 cm long to 300.3 ng/g in muscle of eels the same length. Average dieldrin levels in eels ranged from 43.3 ng/g in the liver to 111.1 ng/g in muscle. Average DDT levels in whiting ranged from 11.0 ng/g in muscle of whiting 15.0 to 21.9 cm long to 2311.0 ng/g in the liver, average dieldrin levels ranged from 3.4 ng/g in muscle to 529.0 ng/g in the liver. Average levels of DDT and metabolites in flounder over 14 cm long ranged from 10.1 ng/g in testis to 650.3 ng/g in the liver, average dieldrin levels ranged from 7.4 in testis to 210.0 ng/g in the liver, Average levels of DDT and metabolites in plaice 14.0 to 19.9 cm long ranged from 6.0 ng/g in muscle to 291.5 ng/g in the liver, average dieldrin levels ranged from 2.3 ng/g in muscle to 116.8 ng/g in the liver. Levels of DDT and metabolites averaged 118.5 ng/g in gobies and 277.5 ng/g in sprats. Dieldrin levels averaged 46.7 ng/g in gobies and 84.0 ng/g in sprats.

78-1286. Grim, B. S. ; Barry, J. W. (US Army Dugway Proving Ground, Dugway, UT 84022) **A canopy penetration model for aerially disseminated insecticide spray released above coniferous forests.** *Natl. Tech. Inform. Serv.* AD-A016,931: 81p.; 1975.

A simple mathematical simulation model has been developed to predict the penetration and vertical distribution of insecticide sprays through coniferous canopies. Input parameters for the model consist of forest characteristics and the wind profile through the canopy. Field trials conducted by the USDA Forest Service were used as a data base. The trials were conducted as a pilot test in the Bitterroot National Forest, Montana, during June 1973, supported by the US Army Dugway Proving Ground, Dugway, Utah. The pilot test consisted of helicopter spraying twelve 40-acre plots. Each plot had a high population level of pine butterfly *Neophasia menapia* (Felder and Felder), a defoliator of the ponderosa pine. Six plots were sprayed with the insecticide Zectran and six with the microorganism, *Bacillus thuringiensis.* (Author abstract by permission)

78-1287. Draggan, S. (Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830) **Assessment of the microcosm as a tool for estimation of environmental transport of toxic materials.** *Natl. Tech. Inform. Serv.* CONF-750838-2: 18p.; 1975. (13 references)

Increases in toxic chemical dissipation make their control in the environment desirable. Environmental control of these substances requires thorough understanding of the functioning of ecosystems potentially receiving chemical input, and of the behavior and fate of released chemicals. Terrestrial microcosms are useful tools in chemical fate studies; however, critical assessment of their ability to simulate ecosystem processes has been limited. This paper provides a rationale for evaluating the utility of microcosms for prediction of chemical fate in natural ecosystems. (Author abstract by permission)

78-1288. Truhlar, J. F. ; Reed, L. A. (Water Resour. Div., US Geol. Serv., Harrisburg, PA 17108) **Occurrence of pesticide residues in four streams draining different land use areas in Pennsylvania.** *Natl. Tech. Inform. Serv.* PB-242,770, 29p.; 1975.

Analysis was made of samples of water, bed material, fish, and soil from four small drainage basins in Pennsylvania in the period 1969 to 1971 to determine the concentrations of chlorinated hydrocarbon insecticides. Analysis was also made of water samples for phenoxyacid herbicides. Each of the basins represented a predominant land-use classification such as forested, general farming, residential, or orchard farming. All water and fish samples showed pesticide concentrations less than the recommended maximum permissible concentrations. DDT or one of its metabolites was the most frequently occurring insecticide and was detected in all media samples except for the forested area soil. The highest combined concentration of DDT and its metabolites was 11.4 μg/l.

78-1289. Mumma, C. E. ; Lawless, E. W. (Midwest Res. Inst., Kansas City, MO 64110) **Survey of industrial processing data. Task I - hexachlorobenzene and hexachlorobutadiene pollution from chlorocarbon processing.** *Natl. Tech. Inform. Serv.* PB-243,641: 187p.; 1975. (50 references)

The potential for environmental contamination of hexachlorobenzene and hexachlorobutadiene was evaluated. Proven or potential sources of HCB and HCBD were identified. Twenty-one other domestically produced chemicals were also examined. The scope of the study for each of the chemicals included identification of production sites and volumes; descriptions of manufacturing processes and environmental and health aspects; description of waste disposal methods, and identification of commercial uses for these products. It was recommended that specific plant sites be monitored by EPA to determine if they were sources of significant discharges or emissions of HCB and/or HCBD into the environment.

78-1290. Natl. Enforc. Invest. Cent., Denver, CO **Translocation of heptachlor and chlordane from Indiana cornfields.** *Nat. Tech. Inform. Serv.* PB-257,643: 61p.; 1975.

A field investigation was conducted from 24 April to 5 June 1975 to determine the fate of chlordane, technical grade, and heptachlor which were disked into field soils before the corn was planted. Two fields at the Purdue Univ., Throckmorton Agric. Res. Cent. were selected for study. The smaller field, 12 ha (29 acres), was treated with a formulation of 72 ECF chlordane (72% technical chlordane) at a rate of 4.5 kg/ha (4 lb/acre). The large field, 13 ha (32 acres), was treated with 3 ECF heptachlor (30.2% heptachlor) at the rate of 2.2 kg/ha (2 lb/acre). Immediately following soil treat-

ment, corn was planted in each field. Air samples were collected from 32 stations, 16 in each cornfield. Water samples from a tile drain underlying the heptachlor treated field, and surface runoff from both fields were collected and analyzed for pesticide contamination. Two sampling techniques were used to determine translocation of heptachlor and chlordane into ambient air. One method used a nylon chiffon screen treated with ethylene glycol and suspended in a metal frame above the fields for approximately 3 days; the second method used an impinger-type sampler in which ambient air was drawn through a liquid reservoir of ethylene glycol for 24 hr. The aerial screen sampler was better for collecting less volatile chlordane, and the impringer sampler was more efficeient for collecting heptachlor. The study demonstrated that heptachlor and chlordane are translocated from soils upon which they are applied and contaminate the surrounding air and water environment. Prevailing winds transported airborn heptachlor and chlordane compounds northeasterly across and away from the cornfields. (Author abstract by permission)

78-1291. Olas, K. L. ; Glenn, R. E.; White, T. M. (Environ. Hyg. Agency, US Army Aberdeen Proving Ground, MD) **Survey of pesticide odor in quarters, Fort Belvoir, Virginia, November 1976.** *Natl. Tech. Inform. Serv.* AD-A039,534: 18p.; 1976.

Soil and air samples were taken from under a building, and air and wipe samples were taken from within the building where a pesticide odor was reported. Sample analyses indicated abnormally high levels of chlordane. The presence of standing water beneath the structure aggravated the problem. Recommendations were made to remedy the problem of water collection under the building.

78-1292. Mansell, R. S. ; Rhoads, F. M.; Hammond, L. C.; Selim, H. M.; Wheeler, W. B.; Zelazny, L. W. (Dep. Soil. Sci., IFAS, Florida Univ., Gainesville, FL 32611) **Movement of fertilizer and herbicide through irrigated sands.** *Natl. Tech. Inform. Serv.* PB-261,505: 57p.; 1976. (20 references)

The simultaneous movement of water and selected agrochemicals (fertilizer nutrients and herbicide) through sandy soils is of particular importance to the efficient use of fertilizers and irrigation water by agricultural crops. Efficient use of fertilizers and herbicides applied to Florida's sandy soils is desirable for maintaining optimum growth of plants and for minimizing groundwater contamination. Laboratory and field experiments as well as mathematical models were used to study water and solute (potassium and phosphorus nutrients and 2,4-D herbicide) transport in two representative Florida soils: Wauchnia sand and Troup sand. In an irrigated and fertilized corn experiment, grain yields and efficiency of water use were observed to be mutually related to both the irrigation and the fertilizer application treatments. Leaching of applied nutrients and irrigation water from the soil "rooting zone" resulted in decreased water use efficiency in these soils. Mathematical models were developed and used to simulate transport and chemical-physical reactions for potassium, phosphorus and 2,4-D herbicide in these soils. Reactions such as adsorption-desorption, chemical precipitation and immobilization (fixed) greatly influenced the movement and thus potential leaching of these solutes through the soil. (Author abstract by permission)

78-1293. Carter, D. L. ; Bondurant, J. A. (West. Reg. Snake River Conserv. Res. Cent., ARS, USDA, Kimberly, ID 83341) **Control of sediments, nutrients, and adsorbed biocides in surface irrigation return flows.** *Natl. Tech. Inform. Serv.* PB-263,610: 53p.; 1976. (49 references)

The technology available for the control of sediments, nutrients, and adsorbed biocides in surface irrigation return flows has been reviewed and evaluated. Some of this technology could be applied immediately to reduce sediment and associated nutrient and biocide concentrations in surface irrigation return flows. Much of the available information needs to be integrated to develop improved control practices. New ideas and new control technology are needed. Economic incentive programs are needed to improve acceptance of control technology. The factors controlling erosion and subsequent sediment concentrations in surface irrigation return flows, and how these factors can be managed to reduce erosion and sediment concentrations are reviewed and discussed. Three approaches (1) eliminating surface runoff, (2) reducing or eliminating erosion, and (3) removing sediments and associated nutrients and biocides from surface irrigation return flows, and control measures for each approach are discussed. Research and demonstration needs for improving and developing new control technology are presented. These include simulation modeling of known erosion parameters, the development of improved irrigation systems and methods, the design of improved irrigation water distribution systems, and field management practices. The need for more information on design and operational criteria for sediment retention basins is discussed. (Author abstract by permission)

78-1294. Shackelford, W. M. ; Keith, L. H. (Anal. Chem. Branch., Environ, Res. Lab., Athens, GA 30601) **Frequency of organic compounds identified in water.** *Natl. Tech. Inform. Serv.* PB-265,470: 617p.; 1976. (5 references)

This study was designed for compilation of a list of all organic compounds that have been found in water. This report contains the names of the compounds, their location or a reference to a published study, the type of water in which they were found, and the date of sampling or report generation. At present the list contains about 5700 entries. Of these 1259 different compounds have been found in one or more of 33 different water types. The list was meant to include all survey-type analyses of water samples, but no attempt was made to include data from studies that include only analysis for specific compounds.

78-1295. Kent, J. C. (Dep. Zool., Idaho State Univ., Pocatello, IA) **The accumulation and distribution of organochlorines and some heavy metals in American Falls Reservoir**

fishes, water and sediment. *Natl. Tech. Inform. Serv.* PB-267,914; 79p.; 1976. (102 references)

Fish samples and sediment from the American Falls Reservoir showed evidence of chlorinated hydrocarbon residues, DDT metabolites, dieldrin, and PCB's. The mean value for PCB's in large suckers was 671 μg/kg. EPA recommendations suggest that PCB concentrations in any sample consumed by any bird or mammal be no greater than 500 μg/kg. Water samples did not contain chlorinated hydrocarbons. Mercury and cadmium were found in all species. Results indicate that the FDA standard of 0.5 mg/kg may be exceeded in crappie, suckers, and large rainbow trout. Mean value for mercury in water was 0.9 μg/l. Consumption of fishes from the reservoir would exceed the recommended limit of cadmium intake. The maximum concentration of cadmium in the water was seven times the value given by the National Academy of Sciences. Arsenic was found only in sediments and water and not in any of the fish sampled.

78-1296. Matsumura, F. (Dep. Entomol., Wisconsin Univ., Madison, WI) **Fate of 2,4,5-T contaminant, 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD) in aquatic environments.** *Natl. Tech. Inform. Serv.* PB-264,187: 22p.; 1977. (9 references)

This study describes the fate of TCDD in lake water and sediment microbial degradation, evaporation and adsorption to sediment. TCDD was mostly bound with the lake sediment where it was stable and not very available for microbial degradation. The binding of TCDD to unknown factors made it difficult to recognize metabolic products. The metabolism of TCDD that occurred in the aqueous phase was genuine, although the extent was small. The metabolites were degraded faster than TCDD since metabolite production decreased with time, indicating an apparent case of intermediary metabolism. The conditions that favored the very limited degradation of TCDD were: the presence of sediment; microbial activity; and/or organic matter in the aqueous phase. Water mediated evaporation of TCDD also occurred.

78-1297. Walker, P. N. ; Lembke, W. D. (Dep. Agric. Eng., Illinois Univ., Urbana Champaign., IL) **Recycling agricultural runoff.** *Natl. Tech. Inform. Serv.* PB-264,578: 99p.; 1977. (72 references)

A review of the literature on irrigation, drainage, reservoirs, pesticides, and nutrients, as they pertain to recycling systems is offered. Nutrient and pesticide recycling result in negligible cost and, benefits agricultural crops. The information available was not sufficient to determine the economic benefit of this recycling to the environment. A model is presented which relates irrigation and drainage to crop yield using intermediate variables of soil, moisture, and air temperature. The model predicts that an acre-ft. of storage would be needed per acre of irrigated watershed. The model can not predict the increase in yield resulting from irrigation and/or drainage. Economic analysis reveals that under present conditions, recycling agricultural runoff is not justifiable as a general practice in the claypan region of Illinois.

78-1298. Mansell, R. S. ; Calvert, D. V.; Stewart, E. H.; Wheeler, W. B.; Rogers, J. S.; Graetz, D. A.; Allen, L. H.; Overman, A. R.; Knipling, E. P. (Univ. Florida, Gainesville, FL 32611) **Fertilizer and pesticide movement from citrus groves in Florida flatwood soils.** *Natl. Tech. Inform. Serv.* PB-272,889: 157p.; 1977. (36 references)

Concentrations and dischrage amounts of NO_3-N, PO_4-P, 2,4-D herbicide, terbacil herbicide, and chlorobenzilate acaricide were determined in surface and subsurface drainage waters from a citrus grove located in an acid, sandy flatwood soil region of southern Florida. The influence of fertilizer and pesticide upon water quality was examined for growing citrus in three soil management treatments: ST (shallow-tilled plowed to 15 cm); DT (deep-tilled and soil mixed within the top 105 cm); and DTL (deep-tilled to 105 cm and 56 Mt/ha of dolomitic limestone mixed with the soil). Average annual losses of NO_3-N in both surface and subsurface drainage from ST, DT, and DTL plots were equivalent to 22.1, 3.1, and 5.4% of total N applied as fertilizer. Average annual losses of PO_4-P in both surface and sursurface drainage from DT, ST, and DTL plots were equivalent to 16.9, 3.6, and 3.5% of total P applied as fertilizer. Deep tillage was thus observed to greatly decrease leaching loss of N and P nutrients. Loss of nutrients in surface runoff was very small for all three losses of terbacil and 2,4-D herbicide. Discharges of these herbicides in subsurface drainage were usually in the order: ST > DTL > DT. Discharge of 2,4-D was greater from drains with open outlets than from drains with submerged outlets. Discharge of terbacil did not differ for open or submerged drains. Chlorobenzilate pesticide was not detected in drainage water from any of the three soil treatments. (Author abstract by permission)

78-1299. Donigian, A. S., Jr. ; Beyerlein, D. C.; Davis, H. H., Jr.; Crawford, N. H. (Hydrocomp. Inc., Palo Alto, CA 94304) **Agricultural runoff management (ARM) model. II. Refinement and testing.** *Natl. Tech. Inform. Serv.* PB-273,105: 312p.; 1977. (27 references)

The Agricultural Runoff Management (ARM) Model has been refined and tested on small agricultural watersheds in Georgia and Michigan. The ARM Model simulates the hydrologic, sediment production, pesticide, and nutrient processes on the land surface and in the soil profile that determine the quantity and quality of agricultural runoff. This report discusses the research and model refinements related to soil moisture and temperature simulation, pesticide degradations, nutrient transformations and plant nutrient uptake. The goal is to evaluate and improve the pesticide and nutrient simulation capabilities of the ARM Model. However, the runoff and sediment modeling is also analyzed since these are the critical transport mechanisms of agricultural chemicals. In general, comparison of simulated and recorded values indicates that the ARM Model can respresent the major processes affecting agricultural runoff and can be a useful tool for planning and analysis. However, discrepancies do exist and point out the need for more testing and research in specific areas. (Author abstract by permission)

78-1300. Ellis, B. G. ; Erickson, A. E.; Wolcott, A. R.; Zabik, M.; Leavitt, R. (Dep. Crop & Soil Sci., Michigan State Univ., East Lansing, MI 48824) **Pesticide runoff losses from small watersheds in Great Lakes basin.** *Natl. Tech. Inform. Serv.* PB-274,084: 90p.; 1977. (5 references)

An assessment is made of sources of variation in pesticide analyses for soil cores taken during the period May 1973 through September 1974 from two watersheds. A number of relationships to methodology, chemical species, topography, soil conditions, and weather are identified. Criteria are given for assessing down-slope movement within and between sampling segments and movement within the profile. A detailed description is given of weather and watershed conditions associated with wintertime runoff events on the larger watershed and with major spring and summer events on both watersheds in 1975. Emphasis is placed on characterizing boundary conditions at the beginning of each event in relation to weather sequences that preceded it. Only portions of the pesticide data set, stored at the Environmental Research Laboratory, Athens, GA, were used in these evaluations. However, important features of soil, topography, management and weather are identified in relation to useful variation in the data. The described relationships should be helpful in interpreting and modeling data from these watersheds for both pesticides and nutrients. (Author abstract by permission)

78-1301. Peakall, D. B. ; Kemp, A. C. (Canadian Wildl. Serv., Ottawa, Ont. K1A 0H3, Canada) **Organochlorine residue levels in herons and raptors in the Transvaal.** *Ostrich* 47(2): 139-141; 1976. (13 references)

Additional information on the levels of persistent pesticides in African species which are at the ends of food chains is reported. Most material came from specimens obtained in the Transvaal, South Africa, during the course of museum collecting. Levels found in specific species are reported and briefly compared to earlier findings in other places. While the agricultural use of DDT in South Africa was restricted in 1970, DDT could be used in special circumstances thereafter on fruit trees, cotton, sorghum, maize, wheat, onions, flowers, and forest plantations. In view of the increasing use of DDT in the southern hemisphere, and the migrating nature of many avian species to South African shores, a monitoring program of selected avian species integrated in food chains is recommmended.

78-1302. Veierov, D. ; Aharonson, N.; Alumot, E. (Pestic. Chem. & Residue Res. Lab., ARO, Volcani Cent., Bet Dagan, Israel) **Residues of HCH isomers and DDT derivatives in Israeli milk and their seasonal fluctuations.** *Phytoparasitica* 5(1): 26-33; 1977. (14 references)

Milk from commercial dairies in Israel was analyzed for pesticides. Average residues were 0.06 ppm DDT, 0.06 ppm DDD (TDE), 0.17 ppm DDE, 0.01 ppm dieldrin, 0.28 ppm γ-HCH (lindane), and 0.38 ppm α-HCH (α-BHC). Milk samples from stores all contained at least 0.04 ppm each of α-HCH, γ-HCH, and DDE. Residues of γ-HCH in milk fat from four commercial dairies varied from 0.1 ppm to 1.6 ppm over an 18 mo period. Although all residues were less than 0.5 ppm in January, residues levels in milk from the four dairies did not all increase or decrease at the same time or follow the same seasonal pattern. Residues of α-HCH in milk fat from four commercial dairies varied from practically 0 to about 1.8 ppm. Residues of DDE in milk fat from four commercial dairies varied from about 0.1 ppm to about 0.5 ppm. A herd of cows was sprayed with HCH according to recommendations for control of herd insects, and their milk was then analyzed. Before spraying, α- and γ-HCH concentrations were 0.02-0.05 ppm. These residues increased to 0.18 ppm 3 days after spraying. By 10 days after spraying, the α -HCH concentration had decreased to about 0.08 ppm, and the γ-HCH concentration had decreased to about 0.06 ppm. During the next 2 to 3 mo, they decreased to 0.02-0.04 ppm. Hexalone was applied 5 mo after the first application. HCH residues rose to 0.38 ppm 3 days later. About 10 days later α-HCH residues had decreased to less than 0.2 ppm, and α -HCH residues had decreased to 0.12 to 0.10 ppm. By about 50 days after this application these residues had decreased to about 0.09 ppm α-BHC and 0.04 ppm γ-HCH. DDE levels increased from about 0.22 ppm before spraying to about 0.23 ppm shortly after the first spraying, then decreased to about 0.18 ppm about 90 days after the first spraying. DDE levels then increased to about 0.24 ppm about 50 days after the second spraying.

78-1303. Cervelli, S. ; Nannipieri, P.; Giovannini, G.; Perna, A. (Lab. Chem. Terreno, CNR, 56100 Pisa, Italy) **Effect of soil on urease inhibition by substituted urea herbicides.** *Soil Biol. Biochem.* 9(6): 393-396; 1977. (11 references)

The kinetic relationships between soil urease and some substituted urea herbicides are considered. The herbicides studied included fenuron, monuron, diuron, and linuron. All herbicides are soil ureas mixed inhibitors and the same inhibition mechanism is presumed to be acitve in each case. The kinetic relationship developed takes into account herbicide adsorption. This relationship allows calculation of the inhibition constants of soil ureas from adsorption constants. A linear relation between Hammett sigma values and log K*i* for fenuron, monuron, and diuron is obtained, and from this the formation of a complex between herbicides and enzyme is proposed. By comparing kinetic constants for soil urease with those obtained for jack bean in the presence of the same herbicides, a possible effect of the soil matrix on the enzyme-herbicide complex is also suggested.

78-1304. Watanabe, I. (Fac. Agric., Iwate Univ., Morioka, 020 Japan) **Pentachlorophenol (PCP) decomposing activity of field soils treated annually with PCP.** *Soil Biol. Biochem.* 10(1): 71-75; 1978. (4 references)

Soil samples from plots treated once annually with PCP and from untreated plots were compared for PCP decomposing activity. Aqueous PCP was mixed with samples under three sets of conditions: 40 μg PCP/g fresh soil and 0.66 ml moisture/g dry soil; 80 μg PCP/g soil and the same

moisture content; and 40 μg PCP/g soil and 0.82 ml moisture/g dry soil. A 0.2% mixture of PCP and celite was mixed with other samples. After incubation of soil with the lower PCP and moisture contents for seven days, soil from untreated plots contained 23 μg PCP/g soil, soil from DDT treated plots contained 28 μg/g soil, soil from PCP treated plots contained 20 μg/g soil, and soil from plots treated with both PCP and DDT contained 13 μg/g soil. Soil with the same moisture content and the higher PCP content was incubated for 14 days, soil from the untreated plots contained 16 μg PCP/g soil, soil from the DDT treated plots contained 21 μg/g, soil from the PCP treated plots contained 14 μg/g, and soil from the plots treated with both PCP and DDT contained 23 μg/g. After 14 days incubation at the higher moisture content following 4 mo storage, soil from untreated plots contained 14 μg PCP/g soil, soil from DDT treated plots contained 9.1 μ/g, soil from PCP treated plots contained 12 μg/g, and soil from plots treated with both PCP and DDT contained 8.3 μg/g. In samples incubated with the PCP-celite mixture, PCP levels in treated samples decreased below the PCP levels in untreated samples after 1 or 2 wk. PCP levels frequently fluctuated in both treated and untreated samples. After 4 wk, PCP content had decreased in all samples from treated plots and in most samples from untreated plots. The number of PCP-decomposing organisms in both types of plots increased during the incubation period. More of these organisms were found in the samples from the treated plot. The PCP content remained relatively constant in soil sterilized with γ-rays. When sterilized soil was inocculated with PCP decomposing *Pseudomonas* species, PCP decreased from an initial concentration of about 40 μg/g to about 13 μg/g after 7 days to about 5 μg/g after 21 days. When sterilized soil was inocculated with serial dilutions of PCP decomposing microorganisms, a greater percentage of the PCP remained in the more diluted soil. At the same dilution, a greater percentage of the PCP remained in the soil of the untreated plot.

78-1305. Elliott, A. P. ; Donawa, A. (Dep. Entomol., Michigan State Univ. East-Lansing, MI 48824) **Effect of 1,2-dibromo-3- chloropropane on oxygen uptake and populations of soil microorganisms.** *Soil Sci.* 124(6): 332-333; 1977. (16 references)

DBCP was added to sandy clay loam soil obtained from a banana field in the West Indies to concentrations of 75, 150, and 600 ppm. Four hr after treatment, total oxygen consumption was 29.9 μl in the 600 ppm sample, as compared to 21.1 μl in the sample containing 75 ppm and 9.9 μl in untreated soil. There were no significant differences in total oxygen consumption between treated and untreated soil after 1 wk. Differences in the initial rate of oxygen uptake and number of bacterial colonies did not become significant until after 4 wk. At this time initial rate of oxygen uptake was 4.3 μl/hr in all treated samples and 2.8 μl/hr in the untreated samples. The sample containing 600 ppm DBCP had 285.0 bacterial colonies, as compared to 185.0 in untreated soil. Total oxygen consumption in 12 hr at this time ranged from 42.4 μl in soil containing 150 or 600 ppm DBCP to 40.0 μl in soil containing 75 ppm DBCP, as compared to 28.0 μl in untreated soil.

78-1306. Mingelgrin, U. ; Saltzman, S.; Yaron, B. (Inst. Soil & Water, ARO, Volcani Cent., Bet Dagan, Israel) **A possible model for the surface-induced hydrolysis of organophosphorus pesticides on kaolinite clays.** *Soil Sci. Soc. Am. J.* 41(3): 519-523; 1977. (28 references)

In this study, attempts were made to elucidate the mechanism of catalytic hydrolysis of organophosphorus pesticides on kaolinite surfaces. It is proposed that hydrolysis occurs by the ligand water molecule of hydrated cations on the surface, and the mechanism may thus be applicable to hydrated cations containing surfaces other than kaolinites. Organophosphate ester molecules are susceptible to hydrolysis of the phosphate ester bond, whereby they are rapidly degraded on the kaolinite surfaces. It is suggested that the organophosphorus molecules undergo hyrolysis by the ligand water associated with the counter ions. Consequently, the degradation process is dependent on the nature of the saturating cation and its hydration status.

78-1307. Hawk, R. E. ; Sheets, T. J.; Cassil, C. C.; Fullmer, O. H.; Fujie, G. H.; McCarthy, J. F. (Agric. Chem. Div., FMC Corp., Middleport, NY 14105) **Effect of application method on the transfer of carbofuran and 3- hydroxycarbofuran residues into cigarette mainstream smoke.** *Tobacco Sci.* 178(1): 32-34; 1976. (7 references)

Tobacco fields were treated with Furadan 10 granules by broadcasting the pesticide over the soil and incorporating it before forming beds, or applying it in a 46 cm band over the beds. The application rate for the latter method was 6.7 kg active ingredient/ha. Tobacco grown in untreated soil was sprayed with a solution of carbofuran or 3-hydroxy carbofuran after shredding. This tobacco and the tobacco grown in the treated soil were processed into cigarettes by a commercial manufacturer. The cigarettes were smoked on a smoking machine, and the condensate from the smoke was analyzed. Applying the pesticide in a band resulted in residues of 15.5 ppm to 16.7 ppm carbofuran and 30.4 ppm to 56.7 ppm 3-hydroxy carbofuran in the cigarettes. The smoke contained carbofuran residues of less than 0.10 ppm and 3-hydroxy carbofuran residues of less than 0.15 ppm. Carbofuran residues in cigarettes ranged from 36.0 ppm when the pesticide was broadcast at 11.2 kg/ha to 202 ppm when it was broadcast at 35.8 kg/ha. Residues of 3-hydroxy carbofuran in cigarettes ranged from 155 ppm when the pesticide was broadcast at 11.2 kg/ha to 802 ppm when it was broadcast at 35.8 kg/ha. Comparable residues in smoke were less than 0.10 ppm to 3.8 ppm carbofuran and less than 0.15 ppm to 6.2 ppm 3-hydroxy carbofuran. Cigarettes made from tobacco sprayed directly with carbofuran contained 39.5 to 510 ppm carbofuran and produced smoke containing 2.2 to 35 ppm carbofuran. Cigarettes made from tobacco sprayed directly with 3-hydroxy carbofuran contained 27.6 to 490 ppm carbofuran and produced smoke containing 0.40 to 16 ppm 3-hydroxy carbofuran.

78-1308. Dawson, V. K. ; Marking, L. L.; Bills, T. D. (Fish Control Lab., La Crosse, WI 54601) **Removal of toxic chemicals from water with activated carbon.** *Trans. Am. Fish. Soc.* 105(1): 119-123; 1976. (23 references)

Aqueous solutions of antimycin, rotenone, TFM (TFN), Dibrom (naled), and juglone were percolated through glass columns containing granular activated carbon. The pesticide concentration after treatment was determined periodically using bioassays in fish. The absorptive capacity of the activated carbon ranged from 0.1 mg/g carbon for rotenone to 64 mg/g carbon for Dibrom. The absorptive capacity increased from 7.1 mg TFM/g carbon to 24.6 mg TFM/g carbon when the depth of carbon was increased from 15 to 60 cm. The capacity increased from 4.9 mg TFM/g carbon to 6.9 TFM/g carbon when the temperature was increased from 7 to 22°C. It decreased from 32.6 mg TFM/g carbon to 7.0 mg TFM/g carbon when pH was increased from 6.5 to 9.5. It decreased from 10.8 to 4.1 mg TFM/g carbon when the flow rate was increased from 50 to 200 ml/min. It increased from 6.4 to 7.1 mg TFM/g carbon when the initial concentrataion was increased from 500 to 1000 mg/l.

78-1309. Hamelink, J. L. ; Waybrant, R. C. (Eli Lilly & Co., Greenfield, IN 46140) **DDE and lindane in a large-scale model lentic ecosystem.** *Trans. Am. Fish. Soc.* 105(1): 124-134; 1976. (32 references)

One of two adjacent flooded limestone quarries was treated with *p,p'*-DDE and lindane. The compounds were coated onto table salt, which was sprinkled over the water. If the pesticides were completely mixed at all depths, the concentration would have been 50 ppt. The total DDE concentration declined 69% within 5 days. The lindane concentration decreased 32% over a period of 102 days and about 50% by 123 days. The DDE concentration remained constant between 123 days and 242 days. Lindane concentrations continued to decline during this period. On day 1, the highest DDE concentration, 53.13 ppt, occurred a depth of 9 m, and the lowest, 8.93 ppt, occurred at 12 m. The highest lindane concentration, 318.60 ppm, occurred at the surface, and the lowest, 4.44 ppt, occurred at 15 m, the bottom of the quarry. After 81 days, the highest DDE concentration, 2.71 ppt, occurred at the quarry floor and the lowest, 1.31 ppt, occurred at 6 m. The highest lindane concentration, 62.81 ppt, occurred at the surface and the lowest, 9.15 ppt, at 9 m. After 358 days the highest DDE concentration, 3.37 ppt, occurred at 3 m and the lowest, 1.15 ppt, at the surface. The highest lindane concentration, 20.13 ppt, occurred at 6 m and the lowest, 7.79 ppt, at the surface. Neither pesticide was detected in bottom mud before treatment. Ten days after treatment DDE levels in sediment ranged from 22.28 ppb at a death of 1.5 cm to undetectable levels at 5.5 cm. Lindane was detected only at 1.5 cm, at a concentration of 1.48 ppb. After 123 days DDE concentrations ranged from 27.27 ppb at 1.5 cm to 0.11 ppb at 3.5 cm. Lindane concentrations ranged from 2.46 ppb at 3.5 cm to 1.40 ppb at 5.5 cm. Both quarries contained bluefill before treatment, and trout were added to the treated quarry when pesticide concentrations had decreased to about 1 ppt DDT and 25 ppt lindane. The DDE concentration factor in bluegill increased from 5.01×10^3 after 5 days to 1.08×10^5 after 81 days. The lindane concentration factor reached 1.47×10^3 at 60 days, then decreased to 4.16×10^2 at 81 days. Concentration factors in trout were 1.81×10^5 for DDE and 4.86×10^2 for lindane 242 days after treatment.

78-1310. Bulkley, R. V. ; Kellogg, R. L.; Shannon, L. R. (Iowa Coop. Fish. Res. Unit, Ames, IA 50010) **Size-related factors associated with dieldrin concentrations in muscle tissue of channel catfish *Ictalurus punctatus*.** *Trans. Am. Fish. Soc.* 105(2): 301-307; 1976. (21 references)

Channel catfish collected from the Des Moines River near Boone, Iowa were analyzed for dieldrin. A quadratic equation was developed relating dieldrin content of the fish to their length. Dieldrin concentration was low for fish under 300 mm long and increased to about 100 ppb for fish 430 mm long. Another quadratic equation was developed relating dieldrin concentration in dorsal muscle of the catfish to the fish's age. Dieldrin concentrations averaged about 50 ppb for fish 5-yr-old and younger and about 200 ppb for 8-yr-old fish. The percentage of fat in dorsal muscle tissue increased rapidly with increased length of shorter fish; it increased more gradually for longer fish. Fish about 8-yr-old had the highest percentage of fat in dorsal muscle tissue. Average dieldrin concentrations ranged from 33.2 ppb in fish 200 to 299 mm long to 940 ppb in fish 600 to 699 mm long when the fish were collected in June. Average dieldrin concentrations in fish 300 to 399 mm long ranged from 5 ppb in October to 109 ppb in July. Average dieldrin concentrations in fish 200 to 299 mm long ranged from 26 ppb in May to 74 in October. Another year, dieldrin concentrations in dorsal muscle of catfish between 150 and 199 mm long remained at about 17 ppb throughout the summer. Concentrations in fish 200 to 299 mm long increased from about 26 ppb in June to over 130 ppb in August that year, and then decreased to about 115 ppb in September. Concentrations in fish 300 to 399 mm long increased from about 20 ppb in June to over 70 ppb in July the same year, then decreased to about 25 ppb in September. Concentrations in fish 450 to 550 mm long increased from about 20 ppb in June to about 60 ppb in July, then decreased to about 37 ppb in September.

78-1311. Pruitt, G. W. ; Grantham, B. J.; Pierce, R. H., Jr. (Lehigh Acres Dev. Inc., Lehigh Acres, FL 33936) **Accumulation and elimination of pentachlorophenol by the Bluegill, *Lepomis macrochirus*.** *Trans. Am. Fish. Soc.* 106(5): 462-465; 1977.

Bluegill were placed in aquariums containing various concentrations of PCP for static bioassays. The 96 hr LC50 was 0.3 mg/l. Accumulation studies were performed on fish placed in water containing 0.1 ppm PCP, and elimination studies returned these fish to clean water after 4 or 16 days. Residues found in the accumulation studies ranged from 0.3 μg/g PCP tissue in the muscle during the first 2 days to 35 μg/g PCP tissue in the liver at 4 and 8 days. Fish removed from the contaminated water after 4 days contained residues

ranging from 0.02 μgPCP/g tissue after 16 days recovery to 4 μg PCP/g tissue in the gills, digestive tract, and liver combined after four days recovery. Fish removed from the contaminated water after 16 days contained residues ranging from 0.03 μg PCP/g tissue in the muscle after 8 days recovery to 5 μgPCP/g tissue in the gills, digestive tract, and liver combined after 2 days recovery and liver after 8 days recovery.

78-1312. Picer, N. ; Picer, M.; Strohal, P. (Cent. Mar. Res., Rudjer Boskovic Inst., Zagreb, Yugoslavia) **The interaction of DDT with suspended particles in sea water.** *Water Air Soil Pollut.* 8(4): 429-440; 1977. (19 references)

DDT interactions with inorganic components and sediments in the seawater were investigated. DDT was selected to represent the chlorinated hydrocarbons which appear in the environment as widely spread pollutants. The influence of DDT concentration on its adsorption onto several solid phases was studied and results are presented as adsorption isotherms. Desportion experiments indicated that these processes were reversible. DDT desorption from quartz was higher than that from limestone, but still significantly lower than that from marine sediments. An examination of the equilibrium distribution of DDT between sea water and the examined surfaces suggest that DDT exists in the investigated systems as a colloid dispersion. The results are discussed in relation to marine pollution.

78-1313. Lee, G. F. ; Hughes, R. A.; Veith, G. D. (Cent. Environ. Stud., Univ. Texas Dallas, Richardson, TX 75080) **Evidence for partial degradation of toxaphene in the aquatic environment.** *Water Air Soil Pollut.* 8(4): 479-484; 1977. (9 references)

A study was initiated on the aqueous environmental chemistry of toxaphene in selected Wisconsin lakes in an attempt to elucidate the apparent differences in the behavior of toxaphene in various lakes treated for rough fish control. Bioassays of toxaphene residues from lake sediments with bluegills showed that toxicity was reduced compared to of the original formulation added to the lake for rough fish control approximately 10 mo earlier. Degradation of commercial toxaphene was also demonstrated in bioassay water where toxaphene concentrations rapidly declined during the first 24 hr after toxaphene addition. It is concluded that commercial toxaphene formulation is somewhat detoxified in the aquatic environment.

78-1314. Wells, D. E. ; Johnstone, S. J. (Freshwater Fish. Lab., Faskally, Pitlochry, Perthshire PH16 5LB, Scotland) **The occurrence of organochlorine residues in rainwater.** *Water Air Soil Pollut.* 9(3): 271-280; 1978. (19 references)

A method for the extraction of organochlorine residues from rainwater using coated polyurethane foam is described. The extraction procedure has been tested for efficiency at low concentrations (sub-ng levels) and the effects of flow rate, pH, suspended particulates and the volume of water analyzed have been determined. Coated foam plugs were incorporated into eight sampling units stationed along the eastern coastline of Britain to monitor atmospheric deposition of organochlorines, in particular PCB, DDT, DDE, TDE, α -BHC, γ-BHC (lindane), dieldrin, and Arochlor 1254. From the results of this study it has been possible to predict the annual contribution of organochlorines from the British mainland to the North Sea.

78-1315. Hild, J. ; Thier, H. P. (Inst. Lebensmittelchem. Univ. Muenster, D-4400 Muenster, Germany) **Analysenmethode fuer Rueckstaende der Thioaether, Sulfoxide und Sulfone von Organophosphor-Pesticiden in Pflanzenmaterial. [Residue analysis of plant material for organophosphorus pesticides with thioether groups including their sulfoxides and sulfones.]** *Z. Lebensm. Unters. Forsch.* 166(1): 9-12; 1978. (4 references) (German)

A GC method for the determination of organophosphorus pesticides and their metabolites containing thioether groups in vegetables is described. Following extraction with acetonitrile, reextraction with dichloromethane, and evaporation, the residue is treated with potassium permanganate solution to oxidize the thioethers to sulfones. After evaporation, the residue is dissolved in acetone, and the pesticides are determined by gas chromatography with alkali flame-ionization detector. The recovery rates, determined for extraction from apples, cabbage, cucumbers, potatoes, cherries, lettuce, carrots, onions, spinach, and tomatoes, were 77-105% for demeton, 84-109% for demeton-*S*- methyl, 70-106% for disulfoton, 82-102% for fenamiphos, 50-90% for fensulfothion, 66-103% for fenthion, and 83-93% for phorate.

See also 78-1235, 78-1245, 78-1330, 78-1335, 78-1384, 78-1388, 78-1399, 78-1414, 78-1460, 78-1462, 78-1476, 78-1477, 78-1492 *and* 78-1494.

78-1316. Felthous, J. M. (South Florida Jr. Coll., Avon Park, FL) **Pesticide poisoning fatality.** *Chem. Eng. News* 56(16): 67-68; 1978.

A 16-mo-old child died after drinking Dermaton (2-chloro-1- ((2,4- dichlorophenyl) vinyl diethyl phosphate), a highly toxic flea and tick pesticide. His parents are now asking for the use of child resistant packaging and proper labeling of poisons. Lack of proper labeling on the bottle prevented the child's proper recognition of the toxic nature of the pesticide. what would have saved their child was child resistant packaging. The use of child resistant packages for such toxic substances is stressed.

78-1317. Cripps, D. J. ; Peters, H. A.; Gocmen, A. (Dep. Med. & Neurol., Univ. Wisconsin, Madison, WI) **Porphyria turcica: (hexachlorobenzene) intoxication after 20 years.** *Clin. Res.* 26(3): 489A; 1978. (1 reference)

Porphyria associated with ingestion of wheat seedlings to which hexachlorobenzene (HCB) had added affected more than 4000 people in eastern Turkey over 4 yr. Clinical examinations were made 20 yr later of 32 of those originally affected. HCB was still detectable in tissue, and abnormal porphyrin metabolism and distinctive porphyria symptoms still persisted. A porphyric's maternal milk was found to contain more than 0.7 ppm HCB.

78-1318. Young, J. F. ; Haley, T. J. (Natl. Cent. Toxicol. Res., FDA, Jefferson, AR 72079) **Pharmacokinetic study of a patient intoxicated with 2,4-dichloro phenoxyacetic acid and 2-methoxy- 3,6-dichlorobenzoic acid.** *Clin. Toxicol.* 11(5): 489-500; 1977. (9 references)

The pharmacokinetics of 2,4-D (2,4-dichloro phenoxyacetic acid) and Dicamba (2-methoxy- 3,6-dichlorobenzoic acid) were studied in a human who had intentionally ingested these materials. Routes of metabolism of 2,4-D and Dicamba are known, but the effects of treatment (with 1- norepinephrine, digoxin, and diphenyl hydantoin) on personal body chemistry are unknown. A hybrid of an analog computer interfaced to a digital computer was used in the analysis. Blood and urine data were modified for the pharmacokinetic analysis. Dicamba was the preferred chemical for elimination studies. The computer examination of the data showed that the urine curve was best fitted to a one compartment model, while blood analysis required a two compartment model. The estimation of chemical half-lives and blood and urine levels were accurately predicted when compared to actual levels.

78-1319. Reichert, E. R. ; Klemmer, H. W.; Haley, T. J.* (Natl. Cent. Toxicol. Res., FDA, Jefferson, AR 72079) **A note on dermal poisoning form mevinphos and parathion.** *Clin. Toxicol.* 12(1): 33-35; 1978. (3 references)

A report is made of a 42-yr-old male who was a victim of organophosphate poisoning. Due to equipment failure, his rubber boots were filled with a mevinphos emulsion. Prior to the accident he had been spraying for approximately 2 hr with parathion and 30 min with mevinphos. Two hr after the accident, symptoms of malaise, fatigue, profuse diaphoresis, nausea and dizziness were noted. The following day 2 mg of atropine were administered, im, and the symptoms ceased. The day after treatment the patient was asymptomatic but exhibited 4+ hyperreflexia. The follow-up treatment is described.

78-1320. Young, J. F. ; Haley, T. J. (Natl. Cent. Toxicol. Res., FDA, Jefferson, AR 72079) **A pharmacokinetic study of pentachlorophenol poisoning and the effect of forced diuresis.** *Clin. Toxicol.* 12(1): 41-48; 1978. (8 references)

A pharmacokinetic study of an intentional pentachlorophenol (PCP) ingestion by an elderly human has been undertaken. Information on the presence or absence of forced diuresis either continuously or for a short restricted period indicates that such treatment would materially reduce the body burden of pentachlorophenol. It is suggested that forced diuresis is the treatment of preference for such intoxication at this time. (Author abstract by permission)

78-1321. Kloeppel, A. ; Weiller, G. (Inst. Res., Univ. Essen, D-4300 Essen, Germany) **Beitrag zur Schwermetallvergiftung, insbesondere durch Thallium. [Heavy-metal poisoning, especially by thallium.]** *Dtsch. Med. Wochenschr.* 103(2): 75-76; 1978. (8 references) (German)

Among heavy metal poisonings, only thallium poisoning is still of clinical significance. Among 1800 cases of poisoning, there were 15 cases of thallium poisoning, 3 cases of lead poisoning and 1 case of iron poisoning. Of the 15 thallium poisonings, 13 were suicidal in nature, and 2 were homicidal. Even after hemodialysis and forced diuresis, thallium can be demonstrated in the urine. It is suggested that the number of thallium poisonings will decrease as coumarine derivatives replace thallium compounds as active ingredients in rat poisons.

78-1322. Campbell, B. C. ; Denno, R. F. (Dep. Entomol., Univ. California, Davis, CA 95616) **The effect of temephos and chlorpyrifos on the aquatic insect community of a New Jersey salt marsh.** *Environ. Entomol.* 5(3): 477-483; 1976. (15 references)

The effects of 4 bi-weekly applications of recommended dosages of mosquito larvicides, temephos and chloropyrifos, on the community structure and seasonal succession of aquatic insects inhabiting salt marsh potholes were examined. Using an open-ended cyclinder, benthic, neustonic and nectonic organisms were sampled at weekly intervals in treated and untreated potholes from May 29 through Aug. 15, 1974. Twenty species of aquatic insects were recovered, including both larval and adult life stages. One corixid, *Trichocorixa verticalis* (Fieber), dominated the pothole community. Effects of the larvicides on insect community structure were tested by monitoring species richness, species diversity, and densities of dominant, subdominant and predatory insects before and after pesticide applications. The re-

sults of this study confirmed that temephos and chlorpyrifos are selective mosquito larvicides, controlling bloodsucking Nematocera without significantly changing the species richness and diversity of the nontarget salt marsh aquatic insect community or altering the densities of the dominant insects. (Author abstract by permission)

78-1323. Itoh, S. (Hiraga Gen. Hosp., Hiraga, Akita, Japan) **[Acute and chronic ocular impairments due to agricultural pesticides.]** *Ganka-Rinsho Iho (Jpn. Rev. Clin. Ophthalmol.)* 72(1): 94-95; 1978. (Japanese)

Ten cases of acute ocular impairments caused by splashing into the eyes of organochlorine, sulfur, and antibiotic pesticides and 10 cases of chronic ocular impairments, in which neoplasia of corneal vessels were recognized were reporeted. Acute impairment comprises conjunctivitis, kerato conjunctivitis, conjunctival edema and contact dermatitis of the eyelids. Conjunctivitis due to captafol, and kerato conjunctivitis accompanying delayed irritative symptoms due to EC of blasticidin S were the most pronounced symptoms. Patients with neoplasia of corneal vessels had symptoms of photophobia, lacrimation, and felt foreign material in the eye. It was also confirmed that those who have vitamin B2 deficient whole blood (8.05 γ/dl) were more sensitive to blasticidin S. It was concluded that chronic ocular impairment results largely from vitamin deficiencies.

78-1324. Uchida, T. ; Kariyone, S. (First Sch. Intern. Med., Fukushima Prefect. Med. Coll., Fukushima, Japan) **[Impairment due to drugs.]** *Gendai Iryo (Mod. Med. Care)* 9(11): 1373-1382; 1977. (20 references) (Japanese)

Blood diseases caused by drugs and pesticides were reviewed and the impairments mechanisms was explained. In the group of drugs which cause aplastic anemia, DDT, parathion, and pentachlorophenol (PCP) were listed as compounds which cause allergic hypersensitivity in some individuals. Streptomycin and oxytetracycline, which may be used as pesticides, were included in the above mentioned group. Novobiocin, used for protecting tomato seedling from *Corynebacterium michiganense*, was found to cause neutropenia and agranulocytosis, as was DDT. Of drugs which cause thromobocytopenia by inducing antibody to thromobocytes, novobiocin was also listed. Insecticides were mentioned among agents which cause acquired hemolytic anemia.

78-1325. Stanford Res. Inst., Menlo Park, CA **Criteria for a recommended standard ... Occupational exposure to methyl parathion.** *Natl. Tech. Inform. Serv.* PB-274,191: 189p.; 1976.

The criteria and recommended standard prepared to meet the need for preventing occupational diseases arising from exposure to methyl parathion are presented. The proposed standard applies only to the manufacture, formulation, application, or other occupational exposure to methyl parathion as applicable under the Occupational Safety and Health Act of 1970, intended to protect against acute systemic poisoning by methyl parathion. Serious effects are produced by methyl parathion contact with skin, mucous membranes, and eyes. Available evidence indicates that the greatest danger to employees is from skin contact and absorption through the skin. Exposure is to be limited to 0.2 mg/m^3 of air determined as a time-weighted average exposure for up to a 10 hr workday in a 40 hr week.

78-1326. Rebello, G. ; Mason, J. K. (Dep. Forensic Med., Med. Sch., Univ. Edinburgh, Edinburgh EH8 9AG, Scotland) **Pulmonary histological appearances in fatal paraquat poisoning.** *Histopathology* 2(1): 53-66; 1978. (29 references)

The histological appearances of the lungs from 11 fatal cases of paraquat poisoning are presented. Main features include: hemorrhage, extrusion of macrophages, edema, honeycombing, fibrosis and, less frequently, epithelial hyperplasia. The changes appear to be progressive once a threshold tissue concentration has been obtained. Histological changes are compared to those observed in poisoning by hyperbaric oxygen. It is suggested that the toxic action of paraquat is sensitization of the lungs to oxygen at atmospheric pressure.

78-1327. Spector, D. ; Whorton, D.; Zachary, J.; Slavin, R. (Dep. Renal Med., Baltimore City Hosp., Baltimore, MD) **Fatal paraquat poisoning: tissue concentrations and implications for treatment.** *Johns, Hopkins Med. J.* 142(4): 110-113; 1978. (22 references)

A 27-yr-old man with a history of mental illness ingested 250 cc of a 29.1% paraquat solution. Activated charcoal and fluids were administered orally 6.5 hr after ingestion, and hemodialysis was begun 17.5 hr after ingestion. Only 72 mg of paraquat, 2% of the dose calculated to have been adsorbed, was removed by hemodialysis. Blood drawn during dialysis contained 1.4 μg paraquat/g blood. The patient died 30.5 hr after ingesting paraquat. Paraquat levels in the tissues after death ranged from 0.43 μg paraquat/g tissue in the brain to 17.0 μg paraquat/g tissue in the kidney. There was extensive evidence of alveolar injury in the lungs and massive selective necrosis of the zonae fasciculata and reticularis in the adrenal gland.

78-1328. Demeter, J. ; Heyndrickx, A. (Dep. Toxicol., State Univ. Ghent, Ghent, Belgium) **Two lethal endosulfan poisonings in man.** *J. Anal. Toxicol.* 2(2): 68-74; 1978. (29 references)

A 28-yr-old man died following ingestion of 20% endosulfan powder, and a 40-yr-old man died following ingestion of 20% endosulfan and 30% dimethoate in xylene. Endosulfan was isolated from postmortem tissue samples by extraction with acetonitrile, washing with n-hexane, mixing with an aqueous sodium sulfate solution and benzene, and isolating the benzene layer. Following cleanup by a chromatographic column, samples obtained from the 28-yr-old victim were analyzed by gas chromatography with electron capture detection, and samples obtained from the 40-yr-old victim were analyzed by reversed-phase liquid chromatographpy with UV detection. The prepared ingested by the

28-yr-old victim contained 12.4% α-endosulfan and 8.1% β -endosulfan. α-Endosulfan concentrations in samples from this victim ranged from 2610 ppm in the stomach to 0.06 ppm in blood. β-Endosulfan concentrations ranged from 1900 ppm in the stomach to 0.015 ppm in blood. This victim died of the combined effects of alcohol and endosulfan. The preparation ingested by the 40-yr-old victim contained 13.3% α -endosulfan, 6.7% β-endosulfan, and 30% dimethoate. α-Endosulfan concentrations in samples from this victim reached 216 ppm in the small intestine content, and were not detected in blood or urine. β-Endosulfan concentrations reached 98 ppm in the small intestine content, and were not detected in blood or urine. Endosulfan sulfate concentrations reached 3.4 ppm in the liver, and were not detected in blood or urine. The detection limit was 0.1 ppm. The ratio of α -endosulfan to β-endosulfan ranged from 2.20 in the small intestine content to 1.43 in the kidney. Dimethoate concentrations ranged from 29 ppm in blood to 2 ppm in the kidney. Dimethoxon concentrations ranged from 21 ppm in blood to 9 ppm in urine. This victim died of the combined effects of dimethoate and endosulfan.

78-1329. Simon, F. A. ; Pickering, L. K. (Univ. Texas, Health Sci. Cent., Houston Med. Sch., Houston, TX) **Phosphorus poisoning.** *J. Am. Med. Assoc.* 236(8): 918; 1976. (3 references)

Yellow phosphorus paste, a common rodenticide, is a highly toxic substance available to the general public. Insufficient labeling of the substance has led to misuse and poisoning. Zinc phosphide, another common rodenticide, is not readily available to the general public. It is a poison used only by professionals because of its degradation to phosphine gas which allows toxicity by ingestion, inhalation or contact. Warfarin is a less potent rodenticide to which rats tend to build up a resistance. Restriction of these three rodenticides to make them available only to the professional exterminator is suggested. The development of new and less toxic rodenticides is recommended in this letter to the editor.

78-1330. Gilman, A. P. ; Fox, G. A.; Peakall, D. B.; Teeple, S. M.; Carroll, T. R.; Haymes, G. T. (Toxic Chem. Div., Canadian Wildl. Serv., Dep. Fish. & Environ., Ottawa, Ont. K1A 0E7, Canada) **Reproductive parameters and egg contaminant levels of Great Lakes herring gulls.** *J. Wildl. Manage.* 41(3): 458-468; 1977. (35 references)

Poor reproductive success and declines in colony size of herring gulls (*Larus argentatus*) have occurred in Lake Ontario at a time when dramatic increases of this species have been reported on the Atlantic seaboard. In 1975 herring gull productivity on Scotch Bonnet Island, Lake Ontario, was 0.15 chicks per pair of adults, one-tenth the productivity of colonies studied on Lakes Erie, Huron and Superior. Reduced nest site defense and decreases in eggs found, egg hatchability and chick survival were observed in the Lake Ontario colony. The major causes of egg failure were disappearance and embryonic death. Hatching success of Lake Ontario eggs by artificial incubation was 23-26% compared to 53-79% for eggs from other areas. Analyses of eggs from 9 gull colonies for organochlorine contaminants indicated that the pattern of relative contamination was: Lakes Ontario > Michigan > Superior > Huron > Erie. Mirex levels were nearly 10 times higher in Lake Ontario than in the other lakes. Movements of herring gulls within the Great Lakes basin are offered as an explanation of variation of individual egg residues in each colony and the moderately high levels of chemical residues in some Lake Superior eggs. (Author abstract by permission)

78-1331. Katoh, Y. ; Torikai, S.; Ohkubo, Y.; Kigawada, R. (Sch. Intern. Med., Kitasato Univ., Sagamihara, Kanagawa, Japan) **[A case of acute renal insufficiency due to copper sulfate.]** *Kanagawa Igakkai Zasshi (J. Kanagawa Med. Assoc.)* 4(2): 39; 1977. (Japanese)

A report is made of a suicide and subsequent autopsy findings. On May 6, 1976, a 45-yr-old man, with a previous history of depression, commited suicide by swallowing $CuSO_4$. He experienced severe vomiting, epigastralgia, and dyspnea. Medical examinaton indicated icterus, ologuria, leukocytosis, and anemia. His BUN was 280 mg/dl; creatine, 13.0 mg/dl; blood gas pH, 7.26; plasma hemoglobin, 1100 mg/dl; and there was severe renal insufficiency. Serum copper, ceruloplasmin, and copper in the gastric juices were 350 μg, 58 mg, and 1416 μg/dl, respectively. After blood dialysis the blood pressure dropped and glucose insulin was given ip. The patient died from respiratory insufficiency on day 40. Autopsy findings indicated edematous swelling of the kidneys; swelling and slight fatty appearance of the liver (wt 2040 g); severe localized congestion of the stomach; the renal tubules clogged with hemoglobin; and edematous degeneration of the renal tubular epithelium.

78-1332. Rimalis, B. Ts. ; Bochkarnikov, V. V. (Lab. Acute Hepatorenal Insufficiency, N. V. Sklifosovskiy Sci. Res. Inst. First Aid, Moscow, USSR) **Ostraya pochechnopechenochnaya nedostatochnost' pri nekotorykh redkikh ostrykh ekzogennykh otraveleniyakh. [Acute hepatorenal insufficiency in some rare acute exogenous poisoning.]** *Klin. Med. (Moscow)* 56(3): 125-128; 1978. (12 references) (Russian)

A 45-yr-old man developed acute hepatorenal insufficiency with jaundice and hepatomegaly 5 days after oral poisoning with 100 g rat poison (zinc phosphide), even though emergency gastric lavage and symptomatic therapy were at first successful. Increased serum enzyme levels were found (alanine transaminase 84.8 U, aspartate transaminase 37.6 U, fructose diphosphate aldolase 29 U and lactate dehydrogenase 500 U). Intravenous treatment with glucose, soda, vitamins, dicarboxylase, prednisolone, unithiol and euphyllin through the umbilical vein, and furosemide stimulation of diuresis were successful. The clinical and biochemical parameters became normal, and the patient was discharged in good condition 36 days after poisoning. These findings indicate that zinc phosphide causes serious liver and kidney damage, which leads to considerable changes in homeostasis.

78-1333. Choe, M. K. (Dep. Lab. Serv., Wellington, Hosp., Wellington 2, New Zealand) **Paraquat poisoning.** *Med. J. Aust.* 1(2): 99; 1978. (12 references)

It is pointed out in a letter to the editor that the use of a modified Janusz Knepil method for the quantitative determination of paraquat poisoning has given good results. The time of the assay is 0.5 hr and the method has been used on several cases of ingested paraquat poisoning.

78-1334. Anonymous **Tougher laws in poison packaging.** *Mod. Packag.* 51(3): 35-38; 1978.

A new EPA proposal requiring child resistant packaging has given the manufacturers of home and garden chemicals a large problem. The Chemical Specialities Manufacturers Association (CSME) examines some of the problems that may be encountered if the proposal is enacted. Many chemical firms have no plans for the production of child resistant packages, claiming public dislike. Other firms have experimented with child resistant packages, with poor results. The time factor necessary for the design and implimentation of child resistant packages is another hinderance in their development. Part of the difficulty in producing a child resistant design is the lack of interest by the packaging manufacturers, and the lack of specific guidelines in the proposal. A re-examination of the proposal, with more specificiation is suggested, as well as the reappraisal by the chemical manufacturers of child resistant packaging.

78-1335. Young, A. L. ; Thalken, C. E.; Ward, W. E. (Dep. Chem. & Physiol., USAF Acad., CO 808040) **Studies of the ecological impact of repetitive aerial applications of herbicides on the ecosystem of test area C-52A, Eglin AFB, Florida.** *Natl. Tech. Inform. Serv.* AD-A032,773: 142p.; 1975. (22 references)

Field investigations were conducted on rodents, insects, aquatic organisms, and plant species associated with a unique 1-square-mile military test site (Test Area C-52A, Eglin Air Force Base, Florida) that was sprayed with 160,948 pounds 2,4,5- trichloro phenoxyacetic acid (2,4,5-T) and 169,292 pounds 2,4- dichlorophenoxy acetic acid (2,4-D). Although neither 2,4-D nor 2,4,5-T residues could be detected in the soils in 1973 or 1974, significant levels (10-710 ppt) of the contaminant 2,3,7,8- tetrachloro dibenzo- *p*-dioxin (TCDD) were found within the top 6 in of test site soils. The report attempts to answer the major questions concerned with the ecological consequences of applying massive quantities of herbicides. (Author abstract by permission)

78-1336. Mauk, C. E. ; Prengle, H. W., Jr.; Payne, J. E. (Houston Res. Inc., Houston, TX) **Oxidation of pesticides by ozone and ultraviolet light.** *Natl. Tech. Inform. Serv.* AD-A028,306: 73p.; 1976. (17 references)

This work was undertaken to establish the feasibility of the oxidation destruction in water of five pesticides: malathion, Baygon (propoxur), Vapam (metam-sodium), pentachlorophenol (PCP), and DDT, by ozone with UV light. Each separate pesticide was treated by ozone with various combinations of ultraviolet intensities and temperatures in a spraged stirred tank reactor. Not only was the pesticide destroyed, as indicated by GC analysis, but also the total organic content of the water, with contributions from the pesticide and from intermediate oxidation products, was reduced to the limit of detectability. A mathematical model was developed, and constants were calculated from the data to characterize the reactions. Data resulted which will permit the design of prototype treatment equipment to remove pesticide from potable water or from effluent. (Author abstract by permission)

78-1337. Morgan, D. P. (Iowa Epidemiol. Stud. Program Iowa Univ., Iowa City, IA) **Recognition and management of pesticide poisonings.** *Natl. Tech. Inform. Serv.* PB-260,381: 61p.; 1976.

This new treatment manual groups pesticides into major classes such as chlorinated hydrocarbons, chlorophenoxy compounds, arsenicals, etc. Under each major class is listed the general chemical structure, pertinent toxicology related to poisoning, common symptoms, a method for confirmation of diagnosis, and the latest information on management and treatment of pesticide poisonings. The text is aimed mainly at physicans treating patients. However, it will also serve as a valuable reference to those who must evaluate the effects of pesticides on human health and investigators of pesticide accidents will benefit by having information useful to confirm pesticide poisonings. (Author abstract by permission)

78-1338. Bondy, M. K. ; Lebow, R. H.; O'Malley, M.; Reilly, T. (Community Health Clin. Inc., Nampa, Idaho) **Occupational health and safety for agricultural workers. Agricultural health and safety considerations for a rural primary health care systems.** *Natl. Tech. Inform. Serv.* PB-274,760: 140-.; 1976.

Activities undertaken at a rural primary health care facilit in Southwestern Idaho to evaluate an occupational safety and health program for agricultural workers, integrated into the facility's everyday operations, are described. Basic objectives were: to assess how such a program can be delivered to a farming community; to evaluate how medical personnel can assess the physical well-being of farm-related persons; to pinpoint agricultural related illnesses and disabilities; to examine migrant farm worker problems and the worker's response to such a program; to find methods to increase clinical interest in occupationally related accidents and disorders; to integrate preventive health measures. A total of 640 examinations were completed, reviewed and statistically analyzed, in addition to interviews with farmers and farm workers, surveys and walk-through evaluations of farms and ranches. Although very few objective agriculture relate health problems were uncovered, clinical formats for examining and recording such problems were designed and tested. Subjective health and safety problems are reported. (Author abstract by permission)

78-1339. Davies, J. E. (Sch. Med., Miami Univ., Miami, FL) **Occupational and environmental pesticide exposure study in South Florida.** *Natl. Tech. Inform. Serv.* PB-266,370: 80p.; 1977. (16 references)

Studies of the urinary pesticide metabolites demonstrated that alkyl phosphates were highly sensitive indices of recent exposure to DMP (dimethyl phthalate) and DEP (diethyl phhalate) organophosphate pesticides. In contrast, urinary phenolic metabolites when available provided sensitive and more specific confirmation of individual organophosphate and carbamate exposures. Urinary metabolites furthered laboratory confirmation of poisonings and facilitated the recognition of subtle differences in organophosphate exposures, properties which lend themselves to use in human monitoring and epidemiologic studies of the occupationally exposed. Urinary alkyl phosphate excretions permitted the recognition of worker protection from residues in the field acquired by wearing fluorocarbon treated clothing. Being group specific rather than pesticide specific, urinary alkyl phosphates were unsatisfactory surveillance instruments when cholinesterase depression or illness was the disease and point of concern and when pesticide exposures were mixed. Important sources of pesticide exposure in a formulating plant included high concentrations in the air and contaminated workers' clothing. Bromophos, a fat soluble organophosphate, was identified in fat for the first time in three formulators, and modification of the analytical laboratory procedures for pesticides in air and in fat increased the number of pesticides identified in air and the recognition of the less polar organophosphates in fat. (Author abstract by permission)

78-1340. Stanford Res. Inst., Menlo Park, CA **Criteria for a recommended standard...occupational exposure to organotin compounds.** *Natl. Tech. Inform. Serv.* PB-274,766: 198p.; 1976.

The criteria, and the recommended standard based thereon, prepared to meet the need for preventing occupational disease or injury arising from exposure to organotins is presented. The proposed standard applies only to workplace exposure to organotins arising from the processing, manufacture, or use of the substances as applicable under the Occupational Safety and Health Act of 1970, and is intended to protect against the development of systemic toxic effects and local effects on the eyes and skin. The major concern in occupational exposure to organotins is the potential for liver, kidney, pulmonary, and central nervous system damage at concentrations above 0.1 mg measured as tin/m^3 air, determined as a time-weighted average for up to a 10-hr work shift in a 40-hr workweek. Dermatitis, irritation of the eyes, and irritation of the upper and lower respiratory tract are associated with organotins. (Author abstract by permission)

78-1341. Garrity-Sandage Associates, Inc., Mason City, IA **Hazardous substances and pesticide survey and training program. Volume 1.** *Natl. Tech. Inform. Serv.* PB-273,211: 150p.; 1977.

Volume I of this report describes a survey made on the use and quantities; the geographic distribution; and the current treatment and disposal practices of hazardous waste generators in both major and minor industries in Iowa. It also estimates the number and manpower characteristics of persons who are in daily contact with such materials as a part of their employment, and identified the training needs in industry of persons who are in daily contact with hazardous materials. (Author abstract by permission)

78-1342. Garrity-Sandage Associates, Inc., Mason City, IA **Hazardous substances and pesticide survey and training programs. Volume II.** *Natl. Tech. Inform. Serv.* PB-273,212: 141p.; 1977.

As a result of the survey in Volume I of this report, Volume II describes the curriculum development designed to assist vocational agriculture teachers and other volunteer group leaders on pesticide handling and disposal of containers. Two pilot modules are included: 1) Recognition and Use of Paints and Solvents, and 2) Health Considerations in the Use of Paints and Solvents. (Author abstract by permission)

78-1343. Apol, A. G. ; Thoburn, T. W. (NIOSH, Cincinnati, OH 45226) **Health hazard evaluation determination composite report on thiram 75 thiram-352.** *Natl. Tech. Inform. Serv.* PB-273,729: 66p.; 1977.

A health hazard evaluation conducted by NIOSH determined that thiram poses a toxic hazard to both nursery workers and tree planters in the reforestation industry in the Pacific Northwest. Environmental sampling yielded nontoxic air levels on thiram, but demonstrated a considerable variation in the amount of thiram to be found on the trees to which the workers were exposed. Skin irritation in a portion of the work force due to direct contact with thiram-treated trees was suggested by symptoms reported during the few days each individual group was studied, in addition to being indentified in the general medical histories. Irritation of eyes, nose and throat caused by thiram exposure was identified by general medical history only. Systemic symptoms were attributed to exposure to thiram by history, particularly when exposed to heavily sprayed trees or when the time was extended beyond five days. These symptoms include headache, dizziness, nausea, diarrhea and other stomach complaints, fatigue and an intolerance to alcohol. It is notable that the alcohol intolerance described by history was generally fairly mild as compared to that experienced by persons taking the drug disulfiram. (Author abstract by permission)

78-1344. Kuhara, H. ; Hashizume, Y.; Tada, H.; Wakabayashi, T.; Kishimoto, H.; Hayashi, K.; Suchi, T. (Sch. Pathol., Fac. Med., Nagoya Munic. Univ., Nagoya, Aichi, Japan) **[Five cases of autopsies on intoxiction due to a herbicide, paraquat dichloride.]** *Nippon Byorigakkai Kaishi (Trans. Soc. Pathol. Jpn.)* 66: 322; 1977. (Japanese)

The results of autopsies on 5 cases of suicides by ingestion of a herbicidal formulation containing 24% parqauat dichloride was reported. Case 1 a female, age 33, took

150 ml po and died after 1 day. Case 2 a female, age 74, took *ca* 20 ml po, and survived 4 days. Case 3 a female, of age 40, ingested *ca* 0.5 glassful, and survived for 8 days. Case 4 a male, age 45, took *ca* 90 ml and survival for 12 hr. Case 5 a female, age 32, took 0.2 glassful and survived for 28 days. The common findings upon clinical examination were increased leucocytes, increased BUN, and a slight increase of GOT and GPT. Non-specific dengeration of skeletal muscule fibers was also noticed.

78-1345. Bier, R. K. ; Osborne, I. J. T. (Martin Luther King Jr. Gen. Hosp., Los Angeles, CA 90059) **Pulmonary changes in paraquat poisoning.** *Radiology* 127(2): 308; 1978. (2 references)

A 22-yr-old man was hospitalized 7 days after ingesting 30 ml paraquat, possibly as a suicide attempt. During the time between ingestion and hospitalization he had suffered nausea, vomiting, hiccups, and abdominal pain. On admission, his blood pH was 7.45, and blood gases were O_2 37 and CO_3 35. Creatinine was 12.6 mg, and BUN was 110 mg. A chest radiograph showed coarse nodulation and interstitial changes. Atelectasis and pleural effusion appeared 9 days after ingestion. Treatment with steroids, bronchodilators, low concentration of oxygen, and saline diuresis resulted in clinical improvement, but the patient suffered respiratory distress and died 21 days after ingestion.

78-1346. Guzelian, P. S. (Author address not given.) **Treatment developed for Kepone poisoning.** *Res. Resour. Rep.* 2(3): 7-8; 1978. (1 reference)

Cholestyramine, a drug used to help reduce blood cholesterol levels, ash been found to help to body eliminate Kepone (chlordecone). Cholestyramine given to former Kepone workers helped to speed up the body's excretion of Kepone, a possible carcinogen. Patients treated with the drug excreted Kepone at an average of 7 times the normal rate, thus reducing the length of exposure to the carcinogen. The cholestyramine helped bind Kepone in the intestine, preventing re-absorption into the blood. In most patients, cholestyramine reduced the severity of Kepone poisoning symptoms. The use of the drug may not be applicable to low levels of Kepone. Cholestyramine may be useful in detoxifying the body of other environmental toxins.

See also 78-1238, 78-1246, 78-1247, 78-1273, 78-1274 *and* 78-1428.

78-1347. Svobodova, Z. (Fish. Res. Inst., Vodnany, Czechoslovakia) **Changes in the red blood picture of the carp intoxicated with organo-phosphate pesticides.** *Acta Vet. (Brno)* 44(1-2): 49-52; 1975. (7 references)

Healthy carp were exposed to LC50 levels of fenitrothion, dichlorvos, and imidan (phosmet). No significant difference was observed in body mass, hemoglobin, mean corpuscular volumn (MCV), or erythrocyte hemoglobin (MCH) between carp exposed to fenitrothion and control fish. The treated fish had 1.84 million red blood cells/mm^3, compared to 1.73 million red blood cells/mm^3 in control carp. The packed cell volume (PCV) and 35.0% in carp exposed to fenitrothion as compared to 30.4 in controls. The mean corpuscular hemoglobin concentration (MCHC) was 21.1% in carp exposed to fenitrothion, compared to 23.8% in controls. There was no significant difference in body mass, red blood cell count, hemoglobin, or MCH between carp exposed to dichlorvos and controls. The PCV was elevated to 35.3% in carp exposed to dichlorvos. The MCV was 201 μm^3 in carp exposed to dichlorvos, compared to 178 μm^3 in controls. The MCHC was reduced to 20.2% in carp exposed to dichlorvos. There was no significant difference in body mass, red blood cell count, hemoglobin, or MCH between carp exposed to imidan and controls. In carp exposed to imidan, the PCV was 36.3%, MCV was 210 μm^3, and MCHC was 20.7%.

78-1348. Nakamura, Y. ; Ishikawa, K.; Kuwatsuka, S. (Lab. Soil Sci., Fac. Agric., Nagoya Univ., Chikusa-ku, Nagoya 464, Japan) **Metabolic fate of benthiocarb herbicide in plants.** *Agric. Biol. Chem.* 41(9): 1613-1620; 1977. (15 references)

The metabolic fate of ^{14}C-benthiocarb in rice and barnyard millet at the 4-leaf stage was studied. Benthiocarb was degraded rapidly after absorption through the root. Most of the radioactivity in the plants was extracted with aqueous acetone. The radioactivity in the water-soluble fraction and the aqueous acetone-unextractable residue increased with decreasing benthiocarb. Desethyl benthiocarb, *S*-4-chlorobenzyl thiocarbamate, 4-chlorobenzoic acid, 2-hydroxy benthiocarb, desethyl 2-hydroxy benthiocarb, 4-chloro-2-hydroxy benzyl alcohol and 4-chlorosalicylic acid were identified as the metabolic products by thin-layer chromatography. Five of them having hydroxy group and/or carboxyl group, and 4-chlorobenzyl alcohol were also found as conjugation products. The same metabolic products were also found in both the root and foliage of both plants. There was little difference in the metabolic pattern of both plants. (Author abstract by permission)

78-1349. Rea, W. J. (8345 Walnut Ln. Suite 240, Dallas, TX 75231) **Environmentally triggered cardiac disease.** *Ann. Allergy* 40(4): 243-251; 1978.

A study was made of twelve patients with non-arterio sclerotic cardiac arrhythmias and/or chest pain refractory to medication and having symptoms related to smooth muscle sensitization. The study was made in a rigidly controlled, relatively fume- and particle-free environment. In ten patients the majority of the signs and symptoms cleared without medication while under environmental control. In 10 of the 12 patients the full range of arrhythmias was reproduced with controlled, repeated individual blind and double blind incitant challenges. Abnormalities of the blood occurred in the complement and T-lymphocyte systems. The distorted homeostatic mechanism included abnormal positive C-reactive protein, serum complements and T-B cell interactions in individual patients. Eight of the patients reacted to exposure to the fumes of an unspecified pesticide mixture.

78-1350. Rozee, K. R. ; Lee, S. H. S.; Crocker, J. F. S.; Safe, S. H. (Dep. Microbiol., Izaak Walton Killam Hosp. Child., Dalhousie Univ., Halifax, N.S., Canada) **Enhanced virus replication in mammalian cells exposed to commercial emulsifiers.** *Appl. Environ. Microbiol.* 35(2): 297-300; 1978. (8 references)

Emulsifiers were previously shown to be largely responsible for the enhancing action of fenitrothion spray components on virus infections in mice. In the present study a variety of commercial emulsifiers were shown to be capable of enhancing the sensitivity of mammalian cell cultures to infection with several viruses. Some of the emulsifiers were not active as enhancers, and those viruses that responded to the enhancing emulsifiers were single-stranded ribonucleic acid viruses. Double-stranded viruses which were tested were non-responders. Based on the time required before enhancement occurred, it is suggested that certain metabolic events must occur in an exposed cell before enhancement will be observed. It is also assumed that the effect is readily reversible.

78-1351. Francis, A. J. ; Spanggord, R. J.*; Ouchi, G. I.; Bohonos, N. (Stanford Res. Inst., Menlo Park, CA 94025) **Cometabolism of DDT analogs by a *Pseudomonas* sp.** *Appl. Environ. Microbiol.* 35(2): 364-367; 1978. (10 references)

A *Pseudomonas* sp. capable of growth on several non-chlorinated and mono-*p*- chloro-substituted analogs of DDT as a sole carbon source degraded bis(*p*- chlorophenyl) methane and 1,1-bis(*p*- chlorophenyl) ethane only in the presence of diphenylethane. The products *p*-chlorophenyl acetic acid and 2-(*p*-chlorophenyl) propionic acid were not further metabolized by the bacterium. Other chlorinated analogs of DDT were found to be recalcitrant to cometabolic degradation with diphenylethane (Author abstract by permission).

78-1352. Lameijer, W. ; van Zwieten, P. A. (Dep. Pharm., Div. Pharmacother., Univ. Amsterdam, Amsterdam C, The Netherlands) **Accelerated elimination of thallium in the rat due to subchronic treatment with furosemide.** *Arch. Toxicol.* 40(1): 7-16; 1978. (7 references)

Thallium sulfate was given orally to rats and blood levels were studied as a function of time. Maximum blood levels of thallium were attained about 1 hr after dosing. Treatment with furosemide for 11 days (30 mg/kg twice daily) significantly accelerated thallium removal from the body

with the urine. Acetazolamide (30 mg/kg) also enhanced excretion of thallium, especially within the initial 24 hr of treatment. These results suggest that furosemide in a high dose is effective in accelerating thallium elimination from the body in the present animal model. Acetazolamide is probably not suitable, as its action was slower and more readily exhausted.

78-1353. Devonshire, A. L. (Dep. Insect. & Fungic., Rothamsted Exp. Stn., Harpenden, Herts. AL5 2JQ, England) **The properties of a carboxylesterase from the peach-potato aphid, *Myzus persicae* (Sulz.), and its role in conferring insecticide resistance.** *Biochem. J.* 167(3): 675-683; 1977. (17 references)

Carboxylesterases from different strains of *Myzus persicae* were examined to try to understand their contribution to insecticide resistance. Preliminary evidence that they are involved comes from the good correlation between the degree of resistance and the carboxylesterase and paraoxon-degrading activity in aphid homogenates. Furthermore, the carboxylesterase associated with resistance could not be separated from the insecticide-degrading enzyme by electrophoresis or ion-exchange chromatography. Homogenates of resistant aphids hydrolyzed paraoxon 60 times faster than did those of susceptible aphids, yet the purified enzymes from both sources had identical catalytic center activities towards this substrate and also towards naphth-1-yl acetate, the latter being hydrolyzed by both 2 x 10^6 times faster than paraoxon. These observations provide evidence that the enzyme from both sources is identical, and that one enzyme hydrolyzes both substrates. This was confirmed by relating the rate of paraoxon hydrolysis to the rate at which paraoxon-inhibited carboxylesterase reactivated. Both had the same first-order rate constant (0.01/min), showing clearly that the hydrolysis of both substrates is brought about by the same enzyme. Its K*m* for naphth-1-yl acetate was 0.131 m*M*, and for paraoxon 75 p*M*. The latter very small value could not be measured directly, but was calculated from substrate-competition studies coupled with measurements of reactivation of the diethyl phosphorylated enzyme. Since the purified enzymes from resistant and susceptible aphids had the same catalytic center activity, the 60-fold difference between strains must be caused by different amounts of the same enzyme resulting from mutations of the regulator gene(s) rather than on the structural gene. (Author abstract by permission)

78-1354. Taranova, N. P. (Dept. Biochem., I. P. Pavlov Inst. Med. I, Leningrad, USSR) **Intensivnost' vklyucheniya atsetata-2-^{14}C v fosfolipidy i kholesterin golovnogo i spinnogo mozga morskikh svinok v norme i pri intoksikatsii triortokrezilfosfatom. [Intensity of ^{14}C-acetate incorporation into the brain and spinal cord phospholipids and cholesterol of healthy guinea pigs and in triorthocresyl phosphate intoxication.]** *Byull. Eksp. Biol. Med.* 84(4): 427-429; 1978. (Russian)

Severe chronic poisoning was produced in adult guinea pigs by the intradermal inoculation of a single 2 to 2.2 ml/kg dose of triorthocresyl phosphate. The effect of the poisoning on the incorporation of ^{14}C-acetate in the phospholipids and cholesterol of the brain stem and lumbosacral segment of the spinal cord was studied 2 hr after the sc injection of ^{14}C-acetate (100 μCi/100 g) 27-33 days after poisoning. Gastrointestinal dysfunction, impairment of the general health status and loss of weight were observed during the first week. The mortality amounted to *ca.* 16%. The neurotoxic effect of triorthocresyl phosphate manifested itself in paresis and paralysis after 2 to 3 weeks. The investigations revealed significant reduction of the acetate incorporation in the phospholipids and cholesterol in the brain stem and lumbosacral segment of the spinal cord alike. The results indicate 40-45% inhibition of the phospholipid synthesis and 52-62% inhibition of the cholesterol synthesis both in the brain stem and in the spinal cord. They also indicate the systemic character in lipid metabolism disorder and alteration of metabolism in oligodendrocytes under the effect of triorthocresyl phosphate.

78-1355. Esaac, E. G. ; Matsumura, F. (Dep. Entomol., Univ. Wisconsin, Madison, WI 53706) **A novel reductive system involving flavorprotein [*sic*] in the rat intestine.** *Bull. Environ. Contam. Toxicol.* 19(1): 15-22; 1978. (24 references)

This study investigated the possible existence of a flavoprotein reductive system in mammalian tissues. Two insecticide substrates, DDT and ^{14}C-mexacarbate, were used. By using the 20,000 *g* supernatant from rat intestine it was established that there was indeed a mexacarbate degradation system which was strongly stimulated by FAD under anaerobic incubation conditions. In this system, mexacarbate was degraded to relatively polar compounds. In addition, the major ether-soluble product, *N*-desmethyl mexacarbate also increased in the presence of FAD. DDT and mexacarbate were incubated with a flavoprotein preparation in the presence or absence of either NADPH or FAD. Addition of FAD, but not NADPH, greatly stimulated the metabolism of both substrates. The most notable increase was observed in the production of TDE by degradation of DDT, and desmethylmexacarbate and water soluble metabolites from the breakdown of mexacarbate.

78-1356. Hyde, K. M.; Crandall, J. C.; Kortman, K. E.; McCoy, W. K. (Biol. Dep., Point Loma Coll., San Diego, CA 92106). **EEG, ECG, and respiratory response to acute insecticide exposure.** *Bull. Environ. Contam. Toxicol.* 19(1): 47-55; 1978. (13 references)

A comparison was made of acute electrophysiological effects of representative organochlorine (OC) and organophosphate (OP) insecticides on the laboratory rat. Concurrent neurological, respiratory, and cardiac involvement were primary concerns. The remarkable distortion of spontaneous cortical potentials recorded during OCl exposure revealed an inordinate cerebral sensitivity to these compounds. All neuroelectrical disturbances noted originated synchronously from the frontal and occipital cortices. Cardiogenic and respiratory anomalies also tented to observe a synchronization with EEG seizures. Relatively inactive interseizure EEGs, ECGs, and pneumographs were consistently recorded during middle and late stages of

poisoning. The absence of electrocortical disturbances following lethal OP injections is evidence of substantial differences in the mechanisms of OP and OCl intoxication.

78-1357. Berteau, P. E. ; Deen, W. A. (Naval Biosci. Lab., Sch. Public Health, Univ. Calif., Naval Supply Cent., Oakland, CA 94625) **A comparison of oral and inhalation toxicities of four insecticides to mice and rats.** *Bull. Environ. Contam. Toxicol.* 19(1): 113-120; 1978. (12 references)

Mice were exposed to 65% chlorpyrifos at aerosol concentrations between 6.7 and 7.9 mg/l, 95% technical grade malathion at an aerosol concentrations of 6.9 mg/l, 10% or 20% Dibrom 14 (naled) at aerosol concentrations between 5.6 and 6.1 mg/l, or 40% resmethrin at an aerosol concentration of 6.8 mg/l. Rats were exposed to 65% chlorpyrifos at aerosol concentration between 5.9 and 7.5 mg/l or 10% Dibrom 14 at aerosol concentrations between 4.7 and 5.5 mg/l. To determine oral toxicity, mice were given 0.1 ml of the pesticide formulation by intubation, and rats were given 0.5 ml of the pesticide formulation by intubation. Rats were injected intraperitoneally with naled to determine the intraperitoneal LD50. Mice and rats were exposed to pesticide aerosols to determine inhalation toxicity. The inhalation LD50 for mice was 94 mg/kg for chlorpyrifos, over 759 mg/kg for malathion, 156 mg/kg for naled, and 99 to 243 mg/kg over resmethrin. The oral LD50 for mice was 152 mg/kg for chlorpyrifos, 1680 mg/kg for malathion, 222 mg/kg for naled, and 1390 mg/kg for resmethrin. The inhalation LD50 for rats were 78 mg/kg for chlorpyrifos and 7.7 mg/kg for naled. The oral LD50 for rats was 169 mg/kg for chlorpyrifos and 160 mg/kg for naled. The intraperitoneal LD50 of naled to rats was 35.0 mg/kg. Cholinesterase decreased from between 50% and 60% of the pre-exposure value in mice inhaling 0.1 mg/kg chlorpyrifos to 30% in mice inhaling 0.5 mg/kg and 6% in mice inhaling 50 mg/kg. Cholinesterase decreased from 70% of the pre-exposure value in mice inhaling 5 mg/kg naled to 27% in mice inhaling 50 mg/kg naled. Cholinesterase decreased from 94% of the pre-exposure value in mice inhaling 50 mg/kg to 89% in mice inhaling 100 mg/kg malathion. When mide were given 95.6 mg/kg chlorpyrifos, plasma cholinesterase was reduced to 13% of its original value immediately after exposure. It reached a minimum of 6% of the pre-exposure value 3 days later and increased to 78% of the pre-exposure value 14 days after exposure. The increase was most rapid on the seventh and eighth day. When mice were given 103 mg/kg naled, plasma cholinesterase was reduced to 32% of the pre-exposure value immediately after exposure. It reached a minimum of 12% of the pre-exposure value 2 days later. By four days after exposure it had increased to more than the pre-exposure value. When mice inhaled 269 mg/kg malathion, plasma cholinesterase was reduced to 45% of its pre-exposure value immediately after exposure. It increased to 96% of the pre-exposure value six days later. The increase became increasingly rapid with time.

78-1358. Warren, R. J. ; Kirkpatrick, R. L.; Young, R. W. (Dep. Fish. & Wildl. Sci., Virginia Polytech. Inst. & State Univ., Blackburg, VA 24061) **Barbiturate-induced sleeping times, liver weights, and reproduction of cottontail rabbits after mirex ingestion.** *Bull. Environ. Contam. Toxicol.* 19(2): 223-228; 1978. (17 references)

The objective of this study was to examine hepatic microsomal enzyme inducation in the cottontail rabbit (*Sylvilagus floridanus*) using sodium pentobarbital-induced sleeping times during and after cessation of dietary exposure to mirex. Two levels of mirex treatment (20 or 26.6 ppm) were used over the 8 wk of the study. After these 8 wk the rabbits were removed from treatment for 3 wk and then mated. A nonsignificant decrease in feed consumption was noted in mirex-treated rabbits. Reproduction was not significantly shorter for mirex-treated animals. Liver weight was significantly greater in mirex-treated rabbits. Thus hepatic microsomal enzyme activity was increased due to mirex exposure. Brain residues of mirex were greater in mirex treated rabbits.

78-1359. Dieter, M. P. ; Ludke, J. L. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Laurel, MD 20811) **Studies on combined effects of organophosphates or carbamates and Morsodren in birds. II. Plasma and cholinesterase in quail fed morsodren and orally dosed with parathion or carbofuran.** *Bull. Environ. Contam. Toxicol.* 19(4): 389-395; 1978. (7 references)

Six-wk-old Coturnix quail were fed for 18 wk doses of 0.05, 0.50, and 5.0 ppm dry weight Morsodren (methylmercury dicyandiamide) or 1% propylene glycol in turkey feed. Randomly chosen birds from each group were fasted 30 min and dosed orally with a sublethal concentration (0.5 mg/kg) of parathion or carbofuran. Their plasma and brain cholinesterase activities were compared 1 hr later. The only effect of Morsodren on the birds was a 17% reduction of cholinesterase activity in birds fed 5 ppm Morsodren. Parathion caused a 29% inhibition of brain cholinesterase activity in control birds and a progressively greater enzyme inhibition in Morsodren fed birds. The differences between the control and Morsodren fed birds were not significant. Carbofuran dosing in Morsodren fed birds resulted in a significantly greater inhibition (42%) of brain cholinesterase. Mercury levels were proportional to the concentrations fed for 18 wk. Prior mercury exposure rendered carbofuran a more potent brain cholinesterase inhibitor.

78-1360. Lue, K. Y. ; de la Cruz, A. A. (Dep. Zool., Mississippi State Univ., Mississippi State, MS 39762) **Mirex incorporation in the environment: toxicity in *Hydra*.** *Bull. Environ. Contam. Toxicol.* 19(4): 412-416; 1978. (24 references)

The toxicity of mirex to the lower invertebrate, *Hydra*, was investigated. The animals were taken from a garden pond and exposed to differing concentrations of mirex solutions in the laboratory. The *Hydra* were found to exhibit behavioral changes in response to the mirex, such as retraction of body tubes and tentacles, as well as the following mortalities after six days: 78% mortality in 1.0 ppm mirex solution, 20% mortality in 0.1 ppm, and 6% mortality in .01 ppm. The LC50 for *Hydra* was determined to be 23.5 ppm

for 3 days. These data indicate a relatively low toxicity of mirex to *Hydra*. As expected, a time lag occurred between the time behavioral changes were noted and the time of death. The background mirex residues in the pond water were determined and found to be negligible. However, it is assumed that *Hydra*, like many other aquatic invertebrates, feed on organisms which concentrate pesticides to a high degree. Further studies must be done to assess the biological magnification of mirex through the food chain.

78-1361. Murakami, M. ; Fukami, J. (Inst. Phys. & Chem. Res., Wako-shi, Saitama 351, Japan) **Persistent pesticides and environmental chemicals are taken up to a greater extent than non-persistent compounds by cultured human cells.** *Bull. Environ. Contam. Toxicol.* 19(4): 423-427; 1978. (13 references)

The uptake by cultured human cells of 11 pesticides and environmental chemicals was studied using a monolayer culture of embryonic lung diploid cells (HEL 299) and radioactively labeled chemicals. The persistent pesticides, DDT, dieldrin, and aldrin had the highest incorporation rates; PCB and HCB (hexachlorobenzene) also had high rates, but less than the chlorinated insecticides. The non-persistent pesticides, malathion, parathion, chlordimeform, 2,4,5-T and 2,4-D were taken up to a lesser extent. The incorporation rate of carbaryl, a non-persistent chemical, fell in between the two groups. Several factors which may affect incorporation were suggested such as solubility in water and lipophilic character. It appeared that the less soluble chemicals were more easily incorporated into the cells. Binding capacity to proteins was also examined. The effect of the chemicals on cell growth was investigated by measuring total cell protein after 48 hr exposure. It was found that there is no relation between cytotoxicity and incorporation rate of the chemicals. None of the chemicals were metabolized by the HEL cells *in vitro*.

78-1362. Baldwin, R. L. ; Wells, M. R. (Dep. Biol., Middle Tennessee State Univ., Murfreesboro, TN 37132) **Effect of DDT on NADH-cytochrome b_5 reductase activity in the freshwater planarian, *Phagocata velata*.** *Bull. Environ. Contam. Toxicol.* 19(4): 428-430; 1978. (9 references)

The effect of DDT on the activity of NADH-cytochrome b_5 reductase was studied in the Planarian *Phagocata velata*. At 6 hr after feeding DDT, an initial increase in NADH-cytochrome reductase was noted. However, this declined at 24 hr, but the decline was not a significant one until about 120 hr after feeding. The DDT concentration used was 10 ppm in corn oil.

78-1363. Granett, J. ; Morang, S.; Hatch, R. (Dep. Entomol., Univ. Maine Orono, Orono, ME) **Reduced movement of precocious male Atlantic Salmon parr into sublethal dimilin-G1 and carrier concentrations.** *Bull. Environ. Contam. Toxicol.* 19(4): 462-464; 1978. (12 references)

A study was conducted to determine whether Dimilin-G1 (diflubenzuron) a candidate larvicide, at larvicidal concentrations would produce a behavioral reaction in Atlantic Salmon. Tests indicated that the fish were repelled by the insecticide and carrier at concentrations at or below projected practical treatment levels for black fly control. The fish chose to swim up treated flumes less frequently than up the untreated flume. When fish did choose a treated flume, the shorter time spent there also indicated a repellency. This could indicate a possible detrimental effect on fish spawning migrations. The carrier, Florex (a hardened attapulgite clay) was apparently more important to the behavioral response than was the insecticide itself.

78-1364. Hattula, M. L. ; Reunanen, H.; Arstila, A. U. (Dep. Chem., Univ. Jyvaskyla, SF-40100 Jyvaskyla 10, Finland) **The toxicity of MCPA to fish. Light and electron microscopy and the chemical analysis of the tissue.** *Bull. Environ. Contam. Toxicol.* 19(4): 465-470; 1978. (8 references)

The LC50 values for MCPA in sea trout and goldfish were established. A subchronic experiment was also carried out with both types of fish kept at concentrations of 10 and 30 ppm for 28 days, and with goldfish kept at 40 and 60 ppm for 42 days. Tissue concentrations of MCPA were of the same magnitude even though the dose of the application differed. At two exposure levels of 10 and 30 ppm MCPA, no changes were noted during the histopathological study in any of the tissues examined. Whole body samples of the goldfish after 40 and 60 ppm exposure did not differ from those of the controls. No obvious changes were found during the electron microscopic studies of the livers of exposed fish.

78-1365. Folmar, L. C. (Natl. Mar. Fish. Serv., Northwest & Alaska Fish. Cent., Coastal Zone & Estuarine Stud. Div., Seattle, WA 98112) **In vitro inhibition of rat brain ATPase, pNPPase, and ATP-^{32}P*i* exchange by chlorinated-diphenyl ethanes and cyclodiene insecticides.** *Bull. Environ. Contam. Toxicol.* 19(4): 481-488; 1978. (36 references)

Experiments were conducted to determine the effects of representative chlorinated diphenyl and cyclodiene compounds on rat brain sodium- potassium-ATPase, pNPPase, and ATP-^{32}P*i* exchange. Pesticides used in the study included chlordane, *p,p* -DDT, *o,p* -DDT, TDE, endrin, dieldrin, heptachlor, heptachlor epoxide, dicofol, and Kepone (chlordecone). In general the results of this study indicated that the cyclodiene type insecticides tested were more inhibitory of sodium- potassium-ATPase, whereas the diphenyl compounds were more inhibitory of the ATP-^{32}P*i* exchange and oxidative phosphorylation. Only two of the insecticides, dicofol and Kepone, significantly inhibited pNPPase, indicating that the sodium catalyzed portion of the overall ATPase reaction is probably the most sensitive site for the action of organochlorine insecticides.

78-1366. Raffin, T. A. ; Simon, L. M.; Theodore, J.; Douglas, W.; Robin, E. D. (Dep. Med., Stanford Univ., Stanford, CA) **Hypoxia protects type II pneumocytes (T-II-P) from paraquat toxicity.** *Clin. Res.* 86(3): 453A; 1978.

Cloned rat type II pneumocytes were placed in flasks containing 0.3 m*M* paraquat. These and control flasks containing pneumocytes, but no paraquat, were exposed to 5% CO_2 and air (PO_2 approximately 150 torr), 95% O_2 (PO_2 approximately 620 torr), or 95% N_2 (PO_2 approximately 15 torr) for 48 hr. For the cells exposed to PO_2 of 15 torr, the control flask contained 3.4 x 10^6 viable cells, and the flask containing paraquat contained 3.1 x 10^6 viable cells. When the cells were exposed to PO_2 of 150 torr, the control flask contained 4.2 x 10^6 viable cells, and the flask containing paraquat contained 2.3 x 10^6 viable cells. When they were exposed to PO_2 of 620 torr, the control flask contained 3.2 x 10^6 viable cells, and the flask containing paraquat contained 1.4 x 10^6 viable cells.

78-1367. Shellenberger, T. E. (Dep. Toxicol., Stanford Res. Inst., Menlo Park, CA 94021) **A multi-generation toxicity evaluation of *p,p* -DDT and dieldrin with Japanese quail. I. Effects on growth and reproduction.** *Drug Chem. Toxicol.* 1(2): 137-146; 1978. (11 references)

Japanese quail chicks were fed diets containing 5 ppm or 50 ppm DDT or 0.1 ppm or 1.0 ppm of dieldrin for 10 wk. Chicks hatched from the eggs laid during the last 2 wk were fed the same diets as their parents for 10 wk. This pattern was repeated for the next two generations. There was no statistical difference in body weights between the treated and untreated groups. Egg production, calculated as combined weekly averages of the P, F_1, and F_2 groups, was 41.7% for the second generation of quail treated with 1.0 ppm dieldrin in the eighth wk of treatment, as compared with 70.1% for the control group. Egg production increased to near normal levels in the next 2 wk. There was no consistent marked impairment of egg production. Hatchability of eggs laid by the first two generations of quail was within the range commonly found with quail. Seventy-nine percent of the eggs laid by the third generation of quail fed 50 ppm DDT were fertile, as compared with 89.4% of those laid by the second generation of quail fed 0.1 ppm dieldrin, 89.5% of those laid by the third generation of quail fed 0.1 ppm dieldrin, and about 95% of those laid by control quail. Hatchability and fertility of eggs laid by the third generation of quail fed 5 ppm DDT were similar to that for controls.

78-1368. Shellenberger, T. E. ; Fullerton, F. R. (Dep. Toxicol., Stanford Res. Inst., Menlo Park, CA 94021) **A multigeneration toxicity evaluation of *p,p* -DDT and dieldrin with Japanese quail. II. Tissue residues analysis.** *Drug Chem. Toxicol.* 1(2): 147-161; 1978. (4 references)

Japanese quail chicks were fed diets containing 5 or 50 ppm DDT, or 0.1 or 1.0 ppm of dieldrin for 10 wk. Chicks hatched from the eggs laid during the last 2 wk were fed the same diets as their parents for 10 wk. This pattern was repeated for the next two generations. Total DDT residues in first generation control quail reached as high as 5.3 ppm, in the fat of male quail 6 wk old. Total DDT residues in the first generation of quail fed 5 ppm DDT reached as high as 80.0 ppm, found in the fat of males after 10 wk. Total DDT residues in quail fed 50 ppm DDT reached 445.0 ppm, found in the fat of males after 5 wk of feeding. No DDT residues were detected in the brain, gonads, or muscle of the first generation of female quail when 12 wk elapsed between feeding and measurement. The highest total DDT residue in female quail was 419.3 ppm, found after 5 wk of feeding, in the fat of the fourth generation of quail fed 50 ppm DDT. The lowest total DDT residue obtained during feeding in female quail was 0.15 ppm, found after 5 wk of feeding, in the brain of the third generation fed 5 ppm DDT. The lowest total DDT residue obtained during feeding in males was 0.14 ppm, found after 5 wk of feeding, in the gonads of the fourth generation fed 5 ppm DDT. Total DDT residues in the yolks of eggs laid by control quail ranged from 0.46 ppm to 0.10 ppm. Total DDT residues in yolks of eggs laid by the first generation of treated quail ranged from 67.80 ppm in yolks of eggs laid after 9 wk of feeding 50 ppm DDT, to 0.10 ppm in yolks of eggs laid 9 wk after discontinuation of feeding 5 ppm DDT. Total DDT residues in yolks of eggs laid by later generations were less extreme. Dieldrin residues in the first generation of quail fed 1.0 ppm dieldrin ranged from 11.14 ppm in the fat of females after 10 wk of feeding, to trace levels in the brain of females 6 wk after feeding dieldrin was discontinued. Dieldrin residues in the second generation of quail fed 0.1 ppm dieldrin ranged from 2.20 ppm in the fat of males 12 wk after feeding was discontinued to 0.33 ppm in the fat of females 12 wk after feeding dieldrin was discontinued. Dieldrin residues in the second generation of quail fed 1.0 ppm dieldrin ranged from 10.96 ppm in the fat of males after 10 wk of feeding to 0.66 ppm in the liver of females 6 wk after feeding of dieldrin was discontinued.

78-1369. Dalvi, R. R. ; Howell, C. D. (Toxicol. Lab., Dep. Physiol. Pharmacol., Sch. Vet. Med., Tuskegee Inst., Tuskegee, AL 36088) **Interaction of parathion and malathion with hepatic cytochrome P-450 from rats treated with phenobarbital and carbon disulfide.** *Drug Chem. Toxicol.* 1(2): 191-202; 1978. (14 references)

Rats were given phenobarbital for enzyme induction followed by a single oral dose of 0.4 ml/kg of carbon disulfide. Control rats were given only phenobarbital. Liver microsomes obtained from these rats were incubated in the presence or absence of an NADPH-generating system. One m*M* parathion or malathion was added to the experimental flasks. The reactions were terminated after 10 min incubation. The amounts of cytochrome P450, when parathion and malathion were present, were not significantly different from controls. The results of spectral binding of SKF 525-A, parathion, and malathion confirmed that binding of sulfur released from CS_2 with cytochrome P-450 inhibited oxidative desulfuration of the insecticides. Oxidative desulfuration of CS_2, parathion, and malathion was analogous. Prior exposure to CS_2 impaired the metabolism of parathion and malathion in the liver.

78-1370. Van Dyke, R. A. (Mayo Clin., Rochester, MN 55901) **Dechlorination mechanisms of chlorinated olefins.**

Environ. Health Perspect. 21: 121-124; 1977. (22 references)

Dechlorination mechanisms of chlorinated hydrocarbons were studied. Cytochrome P450 catalyzes the reaction. Although some dechlorination may take place in the absence of oxygen, the optimum conditions occur when oxygen is present. Halothane undergoes oxidative dechlorination and reductive defluorination. Enzymes do not attack the carbon-halogen bond of chlorinated hydrocarbons. Oxidative dechlorination apparently begins with oxidation of the carbon atom, after which the halogen is released. Enzymatic dechlorination of chlorinated olefins does not readily occur. Because of migration of the chlorines across the double bond, cyclic chloronium ions occur readily as intermediates. Whether epoxides are also intermediates is still unknown.

78-1371. Castro, C. E. (Dep. Nematol., Univ. California, Riverside, CA 92521) **Biodehalogenation.** *Environ. Health Perspect.* 21: 279-283; 1977. (15 references)

Simple alkyl halides are widely used as soil fumigants. Soil organisms, especially *Pseudomonas* and *Flavobacteria*, dehalogenate these substances to nontoxic metabolites. A halide may undergo reductive dehalogenation or biochemical nucleophilic substitution. Soil microbes convert ethylene dibromide almost completely to ethylene by reductive dehalogenation in about 2 mo. Both reductive dehalogenation and biochemical nucleophilic substitution of ethylene dibromide occur in the nematode *Aphelenchus avenae* before it dies. Ethylene and *O*-acetylserine are produced. Soil bacteria dehalogenate 1,2-dibromo-3-chloropropane, producing *n*-propanol. The reaction takes place in three steps.

78-1372. Ruzo, L. O. ; Casida, J. E. (Lab. Pestic. Chem. Toxicol., Dep. Entomol. Sci., Univ. California, Berkeley, CA 94720) **Metabolism and toxicology of pyrethroids with dihalovinyl substituents.** *Environ. Health Perspect.* 21: 285-292; 1977. (49 references)

Replacing the photolabile and biodegradable isobutenyl substituent of pyrethroids with a dihalovinyl group often improves photostability and reduces phytotoxicity compared to other insecticides. The acid moieties of dihalovinyl pyrethroids can be prepared by several routes, each of which introduces its own impurities which must be considered in toxicological evaluations. The toxicity of pyrethroids is also generally reduced by photodecomposition, except for the effects of the resmethrin photoproducts on mice. Replacing the isobutenyl substituent with a dihalovinyl group does not greatly change the rate of metabolism or ease of detoxification in mammals, because other parts of the molecule, especially the ester linkage and alcohol moiety, are more readily attacked metabolically.

78-1373. Pelissier, M. A. ; Faudemay, F.; Manchon, Ph.; Albrecht, R. (Lab. Res. Biol., Inst. Sci. Tech. Aliment., Conserv. Natl. Arts Metiers, 75141 Paris, Cedex 03, France) **Induction par le lindane des monoxygenases microsomales du foie chez le rat: effets d'un regime hypocalcique. [Induction of liver microsomal monooxygenases by lindane: effect of a hypocalcemic diet.]** *Food Cosmet. Toxicol.* 16(1): 27-31; 1978. (19 references) (French)

Two groups of young male rats were fed either a diet with a normal calcium content (1%) or a low-calcium (0.06%) diet for 6 wk. After the first 2 wk each group was subdivided equally into a control group and a group treated for the remaining 4 wk with 60 ppm lindane in the diet. The rats were then killed, livers and kidneys were removed and weighed and hepatic microsomal fractions were prepared for protein, phosphatidyl choline and enzyme measurements. Lindane increased the kidney weights and the rates of aminopyrine and aniline metabolism in the liver, and induced the NADPH-dependent microsomal electron-transport system (cytochrome P450, cytochrome *c* reductase, phosphatidyl choline). Under the experimental conditions used, the low-calcium diet did not appear to affect the metabolism of exogenous substances, although it lowered the P450 contents of the liver microsomes. The maintenance of the normal level of metabolism may be explained by an increase in electron transfer towards the cytochrome from NADPH with induction of NADPH-cytochrome *c* reductase and NADPH-oxidase. Lindane treatment prevented the characteristic inducing effect of calcium deficiency on the specific molecular activity of NADPH-cytochrome *c* reductase [reduction of P450(Fe^{3+})]. (Author abstract by permission)

78-1374. Relimpio, A. M. (Dep. Biochem., Fac. Sci., Univ. Madrid, Madrid, Spain) **Relation between chemical structure and biological activity of anticholinesterases.** *Gen. Pharmacol.* 9(1): 49-53; 1978. (22 references)

The relationship between chemical structure and biological activity of anti cholinesterases was studied using several series of *m-p*-disubstituted phenyl- ethyl- methyl phosphonates. The electronic effects of the para substituents play a preponderant role on the activity, whereas the role of the meta substituents is conditioned by the steric factors. The study of the effects that the solubility exerts on the activity has been shown to be too small to represent an appreciable factor. The results obtained are compared with their diethylphosphate analogs.

78-1375. Stoolmiller, A. (Eunice Kennedy Shriver Cent. Ment. Retard., Walter E. Fernald State Sch., Waltham, MA 02154) **Toxicological study on the effect of diflubenzuron (1-(4-chlorophenyl)- 3- (2,6- difluorobenzoyl)- urea) on rat C-6 astrocytoma cells *in vitro*.** *Gen. Pharmacol.* 9(1): 11-16; 1978. (24 references)

Diflubenzuron was added to the growth medium for cultured rat C-6 astrocytoma cells in concentrations of 0.4%, 0.8%, 1.0%, 1.2%, 1.6%, and 2.0%. The treated cultures contained between 81% and 116% of the number of cells in the control culture, indicating no inhibition. The incorporation of radioactivity from ^{3}H-thymidine or ^{3}H-leucine was unaffected by diflubenzuron. Diflubenzuron was added to the culture media at 5 n*M* and 50 n*M* to determine the effect of diflubenzuron on the incorporation of ^{3}H-acetate and ^{35}S-

sulfate into glycosaminoglycans. Salt solutions of different molarity were used to extract the glycosaminoglycans from the medium. For both treated and control culture media the 0.4 *M* fraction contained about 45% of the acetate label and under 10% of the ^{35}S-sulfate. The 1.2 *M* fraction contained 46% to 53% of the tritium and 85% to 90% of the labeled sulfate in all culture media.

78-1376. Pillai, M. K. K. ; Agarwal, H. C.; Yadav, D. V. (Dep. Zool., Univ. Delhi, Delhi 110007, India) **Tolerance, uptake & metabolism of DDT in *Gambusia affinis*.** *Indian J. Exp. Biol.* 15(1): 40-41; 1977. (6 references)

A study was undertaken to investigate the tolerance of DDT, its uptake, and metabolism in the mosquito fish, *Gambusia affinis*. Median lethal concentrations for *p,p'*-DDT was 60 ppb, while the concentration required to kill 90% of the fish was 140 ppb. The lethal time for 50% mortality to occur for eight different concentrations of DDT ranging from 0.004 to 2.5 ppm was calculated with the lowest value being 12.5 hr. Using 0.00016, 0.0008, and 0.004 ppm concentrations for 16 days, the uptake and metabolism of DDT was studied. Before the experiment had started, the fish had concentrated DDT by a factor of about 25000, whereas the pond water contained 0.064 ppb total DDT. The fish further concentrated DDT by a factor of about 10 in 24 hr. Maximum total DDT concentration was 26.5 ppm after 1 wk exposure to 0.004 ppm DDT in water. Only 2 metabolites of DDT, *p,p'* -DDE and *p,p'*-DDD (TDE) were detected in the fish. DDE was the major metabolite.

78-1377. Kanwar, U. ; Sheikhar, C.; Jhamb, A. (Dep. Zool., Punjab Univ., Chandigarh, India) **Effect of busulphan on the testes of the Myna *Acridotherus tristis*.** *Indian J. Exp. Biol.* 15(1): 68-70; 1977. (22 references)

A study of the effects of Busulphan on the testes of the Myna *Acridotherus tristis* was conducted. Oral administration of the chemical caused a loss of testicular weight and overall shrinkage of seminiferous tubules. Spermatogensis was arrested at the spermatogonial level, causing a decrease in the spermatocyte population. Accompanying this decrease was a gradual degeneration of other germ cells, with the result that only a few spermatogonia and Sertoli cells were left in the tubules after 7 days. Cellular debris was noted in the lumen, and tunica albuginea appeared broken and wavy. Cytochemical tests demonstrated that lipids increased in Sertoli and Leydig cells, but decreased in germ cells. No significant changes were noted in protein and carbohydrate contents of the tubules except for in the basement membrane which becames thick and more reactive after PAS and Hg-BPB treatment.

78-1378. Kaur, K. ; Toor, H. S. (Dep. Zool., Punjab Agric. Univ., Ludhiana 141004, India) **Toxicity of pesticides to embryonic stages of *Cyprinus carpio communis* Linn.** *Indian J. Exp. Biol.* 15(3): 193-196; 1977. (11 references)

Fertilized eggs of *Cyprinus carpio cummunis* were placed in water containing 1.5, 1.0, 0.1, 0.05, or 0.01 ppm of diazinon; 1.0, 0.85, 0.75, 0.65, 0.5, 0.25, 0.1, or 0.02 ppm of fenitrothion; 2.5, 1.0, 0.75, 0.5, 0.25, 0.1, or 0.01 ppm of carbaryl; 5.0, 4.75, 4.0, 2.5, 1.0, 0.25, or 0.01 ppm of malathion; or 135, 125, 110, 100, 80, or 50 ppm of phosphamidon. The percentage of eggs hatching ranged from 95-100% in control groups to as low as 0% for eggs exposed to 1.0 ppm fenitrothion, 2.5 ppm carbaryl, 5 ppm malathion, or 135 ppm phosphamidon. There were no deformed larvae for controls, or for 1.0 or 0.1 ppm diazinon, eggs exposed to 0.65 ppm fenitrothion, 0.1 ppm fenitrothion or less, 0.75 ppm carbaryl or less, 4.0 ppm malathion, 1.0 ppm malathion or less, 125 ppm phosphamidon, and 80 ppm phosphamidon or less. The LC50 for the eggs was 0.008 ppm for diazinon, 0.062 ppm for fenitrothion, 1.4 ppm for carbaryl, 4.57 ppm for malathion, and 112.2 ppm for phosphamidon.

78-1379. Amminikutty, C. K. ; Rege, M. S. (Dep. Zool., Inst. Sci., Bombay 400032, India) **Effects of acute & chronic exposure to pesticides, Thiodan E. C. 35 & Algallol '3' on the liver of Widow tetra *Gymnocorymbus ternetzi* (Boulenger).** *Indian J. Exp. Biol.* 15(3): 197-200; 1977. (11 references)

Static bioassay tests were used to determine the LC50 for endosulfan and Agallol (MEMC) '3' for widow tetra. The 96 hr LC50 was 0.0016 ppm for endosulfan and 0.32 ppm for Agallol '3'. The 24 hr LC50 was 0.0023 ppm for endosulfan and 0.65 ppm for Agallol '3'. Other fish were placed in water containing 0.0008 ppm, 0.00053 ppm, 0.0004 ppm, and 0.0001 ppm of endosulfan or 0.032 ppm, 0.016 ppm, 0.01 ppm, and 0.006 ppm of Agallol '3'. In both acute and chronic exposures, the liver was more severely affected by endosulfan than by Agallol '3'. Destruction of hepatocytes and many islet cells resulted from acute exposure to endosulfan. Hyperplasia and hypertrophy of the islet cells resulted from chronic endosulfan exposure. Agallol '3' exposure caused pyknosis of hepatocytes and islet cells. When Agallol '3' exposure was chronic, focal necrosis of the hepatocytes also resulted.

78-1380. Makhija, S. J. ; Pawar, S. S. (Biochem. Div., Chem. Dep., Marathwada Univ., Aurganabad, India) **Oral intoxication of insecticides & hepatic mixed function oxidase system in rats.** *Indian J. Exp. Biol.* 15(4): 290-293; 1977. (11 references)

This study was designed to investigate the effect of oral administration of *O,O*-dimethyl malathion and isopropoxyphenyl *N*- methylcarbamate (propoxur) alone and in combination on hepatic microsomal drug metabolism and lipid peroxidation in rats. Aminopyrine and ethylmorphine *N*- demethylase activities increased due to increased intoxication in either sex. Acetanilide hydroxylase activity decreased. The magnitude of pyridine binding spectra was decreased in females and increased in males due to insecticide intoxication. Lipid peroxidation, total lipids, and phospholipids were significantly increased regardless of sex variation during administration of *O,O*-dimethyl malathion and isopropoxyphenyl- N-methyl carbamate. UV spectra of lipids exhibited an *in vivo* increase in malonaldehyde formation and diene conjugation band in both sexes.

78-1381. Hurkat, P. C. (Toxicol. Lab., Dep. Physiol. & Biochem., J. L. N. Med. Coll. Ajmer, India) **Histological & histochemical studies in albino rats (*Rattus albicans*) during hundred day oral administration of dieldrin (HEOD).** *Indian J. Exp. Biol.* 15(11): 1049-1052; 1977. (21 references)

Dieldrin-induced hepatotoxic changes in albino rats are discussed. Dieldrin at 5 mg/kg caused slight increases in liver weight and vacuolation of cytoplasm, which were due to depletion of glycogen and infiltration of cholesterol and lipids. The infiltration of lipids in hepatocytes caused migration of cytoplasm toward the periphery of the cytoplasmic margin which caused cell membranes to become prominent and gain a balloon-like cell appearance. There was no change noted in nonspecific acid and alkaline phosphatase activities. It was concluded that dieldrin was only moderately hepatotoxic in rats at this dose schedule.

78-1382. Kumar, C. V. ; Ramaiah, N. J.; Subadra, J. (Dep. Bot., Kakatiya Univ., Warangal 506009, India) **Cytological effects of fungicide Nystatin in *Allium cepa*.** *Indian J. Exp. Biol.* 15(11): 1071-1072; 1977. (8 references)

Root tips of *Allium cepa* were treated for 2, 4, or 6 hr with 200 or 400 μg/ml or the fungicide Nystatin. Controls treated with distilled water had no cellular abnormalities. The incidence of chromosomal fragments in treated root tips ranged from 0.82% in root treated for 2 hr at 200 μg/ml to 2% in root tips treated for 6 hr at 400 μg/ml. The incidence of bridges ranged from 0.68% in root tips treated for 2 hr at 200 μg/ml to 1.5% in root tips treated for 6 hr at 400 μg/ml. The incidence of tripolarity ranged from 7.9% after 4 hr at 200 μg/ml to 0.73% after 6 hr at 200 μg/ml. Incidence of tetrapolarity ranged from 1.2% after 2 hr at 200 μg/ml to 5.4% after 6 hr at 400 μg/ml. Incidence of pentapolarity reached as high as 2.9% after 6 hr at 400 μg/ml. Chromosomal contraction incidence ranged from 9.9% after 2 hr at 200 μg/ml to 17.8% after 6 hr at 400 μg/ml. Incidence of binucleate and multinucleate cells was 1.5% after 2 hr at 200 μg/ml and 4.1% after 6 hr at 400 μg/ml.

78-1383. Singh, B. D. ; Singh, Y.; Singh, R. B.; Singh, V. P.; Singh, R. M.; Bhatnagar, P. S. (Dep. Genet. & Plant Breed., Fac. Agric., Banaras Hindu Univ., Varanasi 221005, India) **Cytogenetic effects of seed treatment with IAA, NAA & 2,4-D in barley *Hordeum vulgare* L.** *Indian J. Exp. Biol.* 15(12): 1105-1108; 1977. (21 references)

Seeds of barley cultivar 'Ratna' were treated with IAA (Indole 3-acetic acid), NAA (α- naphthalene acetic acid), and 2,4-D to study the cytogenetic effects of these compounds. Seeds were soaked in water, treated with solutions of IAA, NAA or 2,4-D for 6 hr, and washed. Root tips were collected after 48 hr, and fixed in a 3:1 ethanol:acetic acid solution. PMC's were collected from random plants, fixed with a modified Carnoy's solution, and stained by the Feulgen technique. Mitotic aberrations were observed at metaphase (chromosome fragments) and ana-telophase (chromatin bridge, fragment, laggard, and bridge with laggard). The 2,4-D induced much higher frequencies of double abberrations. Meiotic anomalies at MI and AI were found, usually at much higher frequencies. Again, the 2,4-D was shown to be more potent. Chiasma frequency was also examined. The 2,4-D, NAA, and IAA all induce mitotic and meiotic aberrations, with the 2,4-D being several times more potent. The frequency of aberrations were comparable at a 100 μg/ml 2,4-D, 1000 μg/ml IAA, and 200 μg/ml NAA level.

78-1384. Haeberer, A. F. ; Nichols, B. C.; Chortyk, O. T. (Tob. Lab., ARS, USDA, Athens, GA 30604) **Effects of application rates on maleic hydrazide residues in Burley Tobacco.** *J. Agric. Food Chem.* 26(2): 385-388; 1978. (11 references)

The fate and stability of maleic hydrazide (MH) applied to Burley Tobacco and soil was examined. Four doses of MH, from 0.1 to twice the recommended amount, were applied to tobacco at various stages of maturity. Residual quantities of MH in green and cured plants, as well as in soil, were determined by a derivatization gas chromatography method. The effects of different application rates to tobacco are discussed. (Author abstract reprinted by permission of the American Chemical Society)

78-1385. Hallett, D. J. ; Khera, K. S.; Stoltz, D. R.; Chu, I.; Villeneuve, D. C.; Trivett, G. (Toxic Chem. Div., Natl. Wildl. Res. Cent., Dep. Fish. & Environ., Canada Wildl. Serv., Ottawa, Ont. K1A 0E7, Canada) **Photomirex: Synthesis and assessment of acute toxicity, tissue distribution, and mutagenicity.** *J. Agric. Food Chem.* 26(2): 388-391; 1978. (25 references)

Photomirex (8-monohydro mirex), the major photodecomposition product of mirex, was synthesized by reductive dechlorination of mirex and the compound characterized by MS, NMR, and GC. The acute oral toxicity of photomirex was determined in rats given single oral dose of 0, 50, 100, 150, and 200 mg/kg of body weight. The 200 mg/kg dose caused 80% mortality in males and 40% mortality in females. The compound accumulated to high levels in adipose tissue and ovaries and to lower levels in liver, kidney, spleen, heart, brain, and testes. Livers and kidneys were mottled and congested in all animals treated with photomirex. Mirex, photomirex, and Kepone were not mutagenic in a standard Ames test including liver microsomal activation. (Author abstract reprinted by permission of the American Chemical Society)

78-1386. McGahen, L. L. ; Tiedje, J. M. (Dep. Crop Soil Sci., Microbiol. Public Health, Mich. State Univ., E. Lansing, MI 48824) **Metabolism of two new acylanilide herbicides, Antor herbicide (H-22234) and Dual (metolachlor) by the soil fungus *Chaetomium globosum*.** *J. Agric. Food Chem.* 26(2): 414-419; 1978. (8 references)

The metabolism of Antor herbicide [2-chloro-*N*- (2′,6′-diethylphenyl)- *N*-methyl (ethyl carboxylate) acetamide] and Dual [2-chloro-*N*(2′-ethyl-6′- methylphenyl)-*N*- (2-methoxy- 1-methylethyl) acetamide] by resting cells of *Chaetomium globosum*, a fungus previously shown to degrade the

related herbicide, alachlor was studied. Disappearance of the herbicides and production of products were followed by GLC analysis of the organic extract. At least ten products were observed with Antor herbicide as the substrate and at least eight with Dual. The products of Antor herbicide, identified by gas chromatography mass spectrometry using electron and chemical ionization were: 2-chloro-*N*- (2′,6′- diethylphenyl) acetamide, 2-hydroxy-*N*- (2 ′-ethyl- 6′-vinylphenyl)- *N* -methyl (ethylcarboxylate) acetamide, ethyl 7-ethyl-2,3-dihydro indoxyacetate, 2-chloro-*N*- (2′ ethyl-6′- vinylphenyl) -*N*- methyl (ethylcarboxylate) acetamide, and ethyl 2,6- diethylphenyl iminoacetate. Compounds produced from Dual were: 2-chloro-*N*- (2′-ethyl- 6′- methylphenyl) acetamide and 2-chloro-*N*- (2′-ethyl- 6′- methylphenyl)- *N*-(2-hydroxy-1-methylethyl) acetamide. Generally, *C. globusum* removes one or both of the R groups from the nitrogen, dehydrogenates the ethyl substitute, and in some cases forms an inodoline ring. It may remove the chloro, methoxy, or ethoxy substituent from the R groups with subsequent hydroxylation at that position. (Author abstract reprinted by permission of the American Chemical Society)

78-1387. Maitre, L. ; Felner, A.; Waldmeier, P.; Kehr, W. (Res. Dep., Pharm. Div., Ciba Geigy Ltd., Basel, Switzerland) **Monoamine oxidase inhibition in brain and liver of rats treated with chlordimeform.** *J. Agric. Food Chem.* 26(2): 442-446; 1978. (37 references)

Chlordimeform is unique among the insecticidal and acaricidal agents it being the only substance of its type that inhibits monoamine oxidase (MAO). In an attempt to define this activity of the compound more precisely *in vivo*, its effects on biogenic amine metabolism in the rat brain were studied. The inhibition of MAO activity induced by chlordimeform in the rat liver and brain *in vivo* is dose related, but relativeiy large amounts (10-30 mg/kg) are required to produce a clear-cut effect. MAO is inhibited to a greater degree in the liver than in the brain: in both organs, type B MAO is affected more than type A, as is evident from the relative extents to which phenethylamine and serotonin are exempt from deamination. Like other MAO inhibitors, chlordimeform alters the metabolism of catecholamines and serotonin, although the endogenous levels of homovanillic acid are depressed much less than those of dihydroxy phenylacetic acid. In contrast to the MAO inhibitors used in human medicine, chlordimeform is a weak inhibitor and has a rather short duration of action, probably because its inhibitory effect is reversible. (Author abstract reprinted by permission of the American Chemical Society)

78-1388. Stalling, D. L. ; Huckins, J. N. (Fish Pestic. Res. Lab., US Fish & Wildl. Serv., Columbia, MO 65201) **Metabolism of 2,4- dichlorophenoxy acetic acid (2,4-D) in Bluegills and water.** *J. Agric. Food Chem.* 26(2): 447-452; 1978. (8 references)

Bluegills (*Lepomis machrochirus*) were exposed outdoors in a plastic pool to one 2 mg/l application of ^{14}C-dimethylamine salt of 2,4- dichlorophenoxy acetic acid (DMA ^{14}C-2,4-D). Fish and water samples were examined during 12 wk exposure to investigate degradation of the herbicide and potential incorporation of ^{14}C fragments into natural biochemicals. We found that ^{14}C was incorporated into both free fatty acids and the fatty acid moiety of triglycerides from fillets and head-viscera samples. In addition, ^{14}C was detected in glycogen isolated from fish liver extract. The biochemical synthesis of ^{14}C amino acids and their subsequent incorporation into proteins was inferred. The incorporation of ^{14}C in fatty acids, glycogen, and protein materials accounted for 85% of the ^{14}C activity in the samples. Also, $^{14}CO_2$ was identified as a degradation production of ring-labeled DMA-^{14}C-2,4-D in a similarly treated plastic pool containing no fish. (Author abstract reprinted by permission of the American Chemical Society)

78-1389. Mendoza, C. E. ; Watanabe, H. (Health Prot. Branch, Natl. Health Welfare, Ottawa, Ont. K1A 0L2, Canada) **Enhancement of the UDP glucuronyltransferase activitiy and biliary excretion rate of 17β-estradiol in the female rat fed hexachlorobenzene.** *J. Agric. Food Chem.* 26(2): 458-460; 1978. (26 references)

Virgin female Wistar rats (190-200 g) were fed ad libitum either a control or 80 ppm HCB (hexachlorobenzene) diet for a period of 5-8 wk. At the end of each feeding period, each rat was anesthetized, its bile duct cannulated, and 17 β- estradiol-*t* injected ip. Bile was collected from 0-2 to 2-4 hr. After 5 wk of treatment with HCB, an increase in porphyrin concentration in the liver was seen. After 8 wk porphyrin concentration was further increased. Maximum induction of liver esterases were observed in the 5 wk group. In contrast, significant enhancement of the 17β-estradiol excretion rate and uridine diphosphate glucuronyl transferase activity was seen only after 8 wk of HCB treatment. The body, liver, or uterine weight, the metabolism of estradiol, and the bile flow rate were not affected by the HCB treatment. (Author abstract reprinted by permission of the American Chemical Society)

78-1390. Kan, C. A. ; Jonker den Rooyen, J. C. (Spelderholt Inst. Poultry Res., Minist. Agric. & Fish., Beekbergen, The Netherlands) **Accumulation and depletion of some organochlorine pesticides in broiler breeder hens during the second laying cycle.** *J. Agric. Food Chem.* 26(2): 465-470; 1978. (7 references)

During the second laying cycle of broiler breeder hens, low levels of organochlorine pesticides [HCB (hexachlorobenzene) α-HCH (α-BHC), β-HCH (β-BHC), γ-HCH (lindane), heptachlor, *p,p′*-DDT, and dieldrin] were administered via their food. Accumulation ratios (levels in product/levels in the food) were higher than during the first laying cycle and ranged for fat on a fat basis from 25 for β -HCH to 1.8 for α-HCH. In eggs, on a whole egg basis the range was 2.3 for β-HCH to 0.16 for α-HCH, and on a fat basis the figures were 20 for β-HCH to 1.4 for α-HCH. Giving noncontaminated food during 11 wk resulted only in a drastic decline of α- and γ-HCH residues in eggs and fat.

Correlation coefficients of residues within hens in abdominal, intramuscular, and egg fat were found to be high (> + 0.9). (Author abstract reprinted by permission of the American Chemical Socieity)

78-1391. Kan, C. A. ; Jonker den Rooyen, J. C. (Spelderholt Inst. Poultry Res., Minist. Agric. & Fish., Beekbergen, The Netherlands) **Second laying cycle effects of a mixture of organochlorine insecticides on broiler breeder hens.** *J. Agric. Food Chem.* 26(2): 470-472; 1978. (5 references)

During the second laying cycle of broiler breeder hens, a mixture of hexachlorobenzene, α-hexachloro cyclohexane (α-BHC), β-hexachloro cyclohexane (β-BHC), γ hexachloro cyclohexane (lindane), heptachlor, *p,p'*-DDT, and dieldrin was added at three different levels between 0.01 and 1 mg/kg to the food with a view to study performance, following a similar treatment during the first laying cycle. Mortality and number of eggs produced/hen present were unaffected even when combined over both laying periods. Egg weight, specific gravity of the egg, and shell thickness did not differ due to the treatments. Fertility and neonatal mortality showed no influence of the treatments, but the number of good quality chicks hatched from fertile eggs was lowered in the highest treatment group. (Author abstract reprinted by permission of the American Chemical Society).

78-1392. Crecelius, C. S. ; Knowles, C. O. (Dep. Entomol., Univ. Missouri, Columbia, MO 65201) **Excretion balance, metabolic fate, and tissue residues following treatment of rats with thidiazuron cotton defoliant.** *J. Agric. Food Chem.* 26(2): 486-494; 1978. (8 references)

Rats rapidly metabolized and eliminated radiolabeled thidiazuron (*N*-phenyl- *N'*-1,2,3- thiadiazol-5- ylurea) cotton defoliant following administration as a single oral dose and as a dietary supplement. Both urine and feces were important routes for elimination of the xenobiotic; greater than 90% of the dose was accounted for in the urine and feces by 96 hr after administration to rats of a single oral dose. The parent compound was detected in the feces and to a much lesser extent in the urine of rats treated with thidiazuron as a dietary supplement but was not detected in excreta from single oral dose studies. The two major metabolites were *N* -4- hydroxyphenyl- *N'*-1,2,3- thiadiazol- 5-ylurea or 4-hydroxyphenyl- thiadiazuron and phenylurea. 4-Hydroxyphenyl thidiazuron was present in urine (free and conjugated), feces, and milk. Phenylurea was detected in urine, and its formation may represent a novel cleavage for substituted ureas. Tissue levels of radiocarb were in the ppb range, and there was no evidence for the formation of persistent residues in rats. (Author abstract reprinted by permission of the American Chemical Society)

78-1393. Odanaka, Y. ; Matano, O.; Gato, S. (Inst. Environ. Toxicol., Kodaira, Tokyo 187, Japan) **Identification of dimethylated arsenic by gas chromatography mass spectrometry in blood, urine, and feces of rats treated with ferric methanearsonate.** *J. Agric. Food Chem.* 26(2): 505-507; 1978. (9 references)

Dimethylarsinate [salt of dimethyl arsinic acid ($(CH_3)_2AsO_2H$; DMAA)] was detected as a metabolite in the blood, urine, and feces of male Wistar rats, which had been given a 100 mg/kg dose po of ferric methanearsonate [$(CH_3AsO_3H)_3Fe_2$; MAF]. Following separation with inorganic arsenic and methanearsonate [salt of methanearsonic acid ($CH_3AsO_3H_2$; MAA)] by cellulose thin-layer chromatography (TLC), dimethylarsinate was converted to dimethylarsine ($(CH_3)_2AsH_2$) by reduction and identified by gas chromatography mass spectrometry (GCMS). (Author abstract reprinted by permission of the American Chemical Society)

78-1394. Herin, R. A. ; Komeil, A. A.; Graham, D. G.; Curley, A.; Abou-Donia, M. B.* (Dep. Pharmacol., Med. Cent., Duke Univ., Durham, NC 27710) **Delayed neurotoxicity induced by organophosphorus compounds in the wild mallard duckling: effect of leptophos.** *J. Environ. Pathol. Toxicol.* 1(3): 233-240; 1978. (23 references)

Mallard ducklings were fed game bird ration containing 260 ppm leptophos until ataxia developed. They were then given control ration. The ducklings developed ataxia between the 17th and the 23rd day of administration. Two of the five ducklings fed leptophos developed paralysis, one after 23 days and one after 51 days. Degeneration of the sciatic nerve was found in another duckling. Degeneration of the spinal cord occurred in four ducklings; in one of the ducklings it was severe. Spinal lesions were identical to those found in hens treated with leptophos. Leptophos also caused loss of appetite and retardation of growth.

78-1395. Ou, L. T. ; Rothwell, D. F.; Wheeler, W. B.; Davidson, J. M. (Univ. Florida, Gainesville, FL 32611) **The effect of high 2,4-D concentrations on degradation and carbon dioxide evolution in soils.** *J. Environ. Qual.* 7(2): 241-246; 1978. (13 references)

A laboratory experiment was conducted to determine the degradation of high concentrations of 2,4-D (2,4-dichloro phenoxyacetic acid) and CO_2 evolution in three soils. Two forms of 2,4-D, technical grade and formulated, were added to each soil sample at rates of 50, 500, 5,000 and 20,000 μg/g of soil (ppm). Degradation of the 2,4-D was measured by $^{14}CO_2$ evolution resulting from the oxidation of uniformly ring-labeled carbon. At an application rate of 500 ppm, all three soils degraded 2,4-D. At 5,000 and 20,000 ppm, degradation occurred in the Webster silty clay loam and Terra Ceia organic soil, but not in the Cecil sandy loam during 80 days of incubation. The degradation rate was generally higher for the formulated 2,4-D than the technical grade material. For the higher 2,4-D concentrations 5,000 or 20,000 ppm, when extensive degradation occurred, total CO_2 evolution was also greatly stimulated, and the pattern of total CO_2 evolution rate exhibited a two-peak response. Carbon dioxide-carbon (CO_2C) from the first peak appeared to be mainly from the formulation materials or from the impurities and CO_2-C from the second peak was mainly from 2,4-D-C. (Author abstract by permission)

78-1396. Harding, G. C. H. ; Vass, W. P. (Dep. Environ. Fish. & Mar. Serv., Mar. Ecol. Lab., Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada) **Uptake from sea water and clearance of ^{14}C-*o,p'*-DDT by the marine copepod *Calanus finmarchicus*. *J. Fish. Res. Board Canada* 34(2): 177-182; 1977. (15 references)

It is impossible to measure the uptake rate of *p,p'* -DDT by copepods from sea water directly since uptake and depuration occur simultaneously. Copepods were found to lose DDT exponentially in flowing sea water. Five experiments were performed to obtain uptake rates with DDT concentrations ranging from 32.5 to 1337 ppt in sea water. A model for copepods uptake of DDT was determined which accounts for influx and efflux of DDT. Calculated influx rate constants varied between 1.5 and 2.7 x 10^3/day. These results enable prediction of DDT levels in non-feeding copepods if the concentration of DDT in sea water is known. (Author abstract by permission)

78-1397. Labrecque, G. C. ; Fye, R. L. (Insects Affect. Man & Anim. Res. Lab., ARS, USDA, Gainesville, FL 32604) **Cytogenetic and other effects of the chemosterilants tepa, metapa, apholate and hempa in insects (a review).** *Mutat. Res.* 47(2): 99-113; 1978. (152 references)

A review of the literature revealed that the chemosterilants tepa (tris(1- aziridinyl) phosphine oxide), metapa (tris (2-methyl- 1-aziridinyl) phosphine oxide), apholate (2,-2,4,4,6,6- hexakis (1-aziridinyl)- 2,2,4,4,6,6- hexahydro- 1,3,-5,2,4,6- triazatri phosphorine), and hempa (hexamethyl melamine) affected both reproductive and somatic tissues in over 65 species of insects. The effects were cytological, physiological, and genetic and varied from slight to severe. In some cases the deleterious effects may have been species-specific, but in general, they appeared to be dose-dependent. More than 150 publications are cited. (Author abstract by permission)

78-1398. Rogers, S. J. ; Skaar, P. D.; Tindall, K. R.; Vyse, E. R.; Warren, G. (Montana State Univ., Bozeman, MT 59715) **Mutagenicity of the fungicide Dexon.** *Mutat. Res.* 53(1): 91; 1978.

The mutagenic potential of the fungicide Dexon (fenaminosulf) in prokaryotic and eukaryotic test systems was confirmed. Dexon is markedly more toxic to *urvA, lexA, recA* and *polA* mutants of *Escherichia coli* B than it is to isogenic wild-type strains. It increases the rate of forward mutation to D-cycloserine and streptomycin resistance in *E. coli* B, as well as the rate of reversion in *Salmonella typhimurium* strains specific for transitions and frame-shift mutations. Dexon also increased the rate of gene conversion at the *trp* locus in *Saccharomyces cerevisiae*, strain D-7 and the rate of induction of sex-linked recessive lethals in *Drosphila melanogaster*. [At the Eighth Annual Meeting of the American Environmental Mutagen Society.]

78-1399. Sanborn, J. R. (Southeast Environ. Res. Lab., Athens, GA) **The fate of select pesticides in the aquatic environment.** *Natl. Tech. Inform. Serv.* PB-239,749: 83p.; 1974. (64 references)

Seventeen organic pesticides and five industrial chemicals were examined in a terrestrial-aquatic model ecosystem in an effort to determine their persistence and accumulation by the organisms of this system. Several classes of pesticides are represtented since one or more insecticides, herbicides, miticides or plasticizers were investigated. The use of this system for examining uptake and persistence of widely used agricultural chemicals provides the necessary data for comparison of field data to provide a framework which can be used to assess the potential environmental impact of new pesticides before they are given a recommendation for generalized use. The data obtained suggest that this model ecosystem is useful for the determination of the uptake and persistence of pesticides by the organisms. In general, it was found that most chemicals, with the exception of the persistent soil insecticide, dieldrin, underwent extensive degradation under the experimental conditions of the system. Dieldrin was exceptional in its behavior in that > 96% of the radioactivity isolated from the organisms was unchanged dieldrin, clearly indicating the extreme inertness of this chlorinated hydrocarbon to undergo biological or chemical modification. (Author abstract by permission)

78-1400. Juengst, F. W., Jr. ; Alexander, M. (Dept. Agron, Cornell Univ., Ithaca, NY) **Effect of environmental conditions on the degradation of DDT in model marine ecosystems.** *Natl. Tech. Inform. Serv.* AD-A020,570: 6p.; 1975.

No products of DDT metabolism were detected in surface seawater at temperatures of 4C to 32°C, at various salinities and in the presence or absence of O_2. DDD (TDE) was formed from DDT in surface waters supplemented with *Cylindrospermum* sp. cells, and both DDD and DDE were produced in surface water-sediment model ecosystems receiving organic amendments. Flooded sediments were especially active in converting DDT to DDD, and an unknown compound accomulated in these sediments. None of a series of compounds known to be generated microbiologically from DDT *in vitro* was observed in the model ecosystems. (Author abstract by permission)

78-1401. Rosenblatt, D. H. ; Muul, I.; Miller, T. A.; Cogley, D. R.; Dacre, J. C. (Med. Bioeng. Res. Develop. Lab., US Army, Fort Detrick, MD 21701) **Problem definition studies on potential environmental pollutants. II. Physical, chemical, toxicological, and biological properties of 16 substances.** *Natl. Tech. Inform. Serv.* AD-D030,428: 290p.; 1975.

This report establishes a data base of physical, chemical, toxicological, and biological properties for: mustard gas; thiodiglycol; lewisite; lewisite oxide; methylphosphonic acid; isopropyl methylphosphonate; diisopropyl methylphosphonate; chlorate salts; wheat rust; inorganic arsenic compounds; mercury and its salts; dicyclopentadiene; aldrin; dieldrin; chlordane; and endrin. It also provides a summary of pertinent information concerning: physical and chemical proper-

ties; analytical methods; mammalian toxicology; ecological considerations for wildlife, birds, fish, reptiles, amphibians, invertebrates, microorganisms, and plants; and existing standards. (Author abstract by permission)

78-1402. Paris, D. F. ; Lewis, D. L.; Barnett, J. T., Jr.; Baughman, G. L. (Southeast Environ. Res. Lab., EPA, Athens, GA) **Microbial degradation and accumulation of pesticides in aquatic systems.** *Natl. Tech. Inform. Serv.* PB-241,293: 45p.; 1975. (55 references)

The microbial degradation and sorption of carbaryl, malathion, butoxyethyl ester of 2,4- dichloro phenoxyacetic acid (2,4-DBE), methoxychlor, atrazine, diazinon, captan, parathion, and toxaphene were investigated. Malathion and 2,4-DBE were found to undergo transformation readily in both bacterial and fungal cultures. Degradation of malathion and 2,4-DBE at low concentrations (< 1 mg/l) in batch cultures of bacteria followed second-order kinetics as predicted by the Michaelis-Menten theory. A single isomer, β-monoacid of malathion, was the primary metabolite in transformation of malathion by both bacterial and fungal populations. The major metabolite found in 2,4-DBE studies was 2,4-D. Carbaryl underwent chemical hydrolysis to α-naphthol in both heterogeneous bacterial cultures and uninoculated controls. In the cultures α-naphthol was metabolized to 1,4- naphthoquinone and two unidentified compounds. Bacterial degradation of methoxychlor was slower than bacterial degradation of malathion or 2,4-DBE. The pesticide was metabolized to methoxychlor-DDE. Rapid and extensive sorption of pesticides to fungi, bacteria, and algae was observed with methoxychlor and toxaphene, but not with any of the other pesticides investigated. Distribution coefficients for methoxychlor ranged from 1.2×10^3 to 4.8×10^4 for the different organisms whereas the coefficients for toxaphene ranged from 3.4×10^3 to 1.7×10^4. Captan underwent neither microbial degradation nor sorption because of its rapid hydrolysis in water. (Author abstract by permission)

78-1403. Bunting, D. L. ; Robertson, E. B., Jr. (Dep. Zool., Tennessee Univ., Knoxville, TN) **Lethal and sublethal effects of herbicides on zooplankton species.** *Natl. Tech. Inform. Serv.* PB-241,337: 35p.; 1975. (29 references)

Nauplii, 0-4 hr old, of the copepod *Cyclons yernalis* were exposed to concentration ranges of amitrole, amitrole-T, and the free acid and alkanolamine salt of 2,4-D. LD50, LT50, and incipient lethal levels were calculated and discussed. Adult *Cyclops vernalis, Mesocyclops edax*, and *Macrocyclops albidus* were exposed to amitrole and the 2,4-D salt to provide comparative data. Third and fourth instar larvae of *Chaoborus punctipennis*, a planktonic dipteran, were subjected to static tests of the commercial herbicides contaming 2,4-D, ammonium sulfamate, and amitrole. Fifty percent responses were calculated for each herbicide, and an emergence-suppression threshold was noted for amitrole. Data were obtained for three rotifers, *Keratella cohlearis, K. americana.* and *Brachionus angularis*, relative to the acute toxicity of six water soluble or water emulsifiable forms of 2,4,5-T. Technical 2,4,5-T was also assayed against *K. cochlearis*. Data on the effects of food level on LT50, and food level, dose, and exposure time on LC50 were given. The effects of temperature, exposure time, and concentration of aminotriazole on *Daphnia pulex* females and males were measured. LT50 data were presented along with a discussion of sublethal effects and information from preliminary tests using forms of 2,4-D and 2,4,5-T. (Author abstract by permission)

78-1404. Lee, J. H. ; Nash, C. E.; Sylvester, J. R. (Oceanic Inst., Waimanalo, HI) **Effects of mirex and methoxychlor on striped mullet, *Mugil cephalus* L.** *Natl. Tech. Inform. Serv.* PB-241,635: 18p.; 1975. (29 references)

The effects of two chlorinated insecticides, mirex and methoxychlor, on striped mullet, *Mugil cephalus* L., were studied. Test concentrations of both insecticides used were 0.01, 0.1, 1.0 and 10.0 ppm in dynamic bioassay. Young juveniles were more susceptible to mirex exposure than older juveniles or adults. No mortalities occurred in older juveniles and adults exposed to mirex for 96 hr. For young juveniles, mortalities were highest in concentrations of 0.1 and 1.0 ppm and were less in concentrations of 0.01 and 10.0 ppm. Significant amounts of mirex residues were accumulated in the body tissues of the test fish; concentrations increased with increased environmental concentrations. Methoxychlor was more toxic to mullet than mirex. Mortalities were greater than 90% over a 96 hr period for all life stages studied at concentrations of 0.1, 1.0 and 10.0 ppm. Mortality at a concentration of 0.01 was 5.1% or less for 96 hr. Relative to mirex, small amounts of methoxychlor residues accumulated in the tissues of the test fish. Results of the experiments on eggs and larvae were inconclusive. Egg survival was slightly better in mirex than in methoxychlor over a 96 hr period. Larval survival was generally better in mirex than methoxychlor. (Author abstract by permission)

78-1405. Lembi, C. A. ; Coleridge, S. E. (Dep. Bot., Purdue Univ., Lafayette, IN) **Selective toxicity of detergents and herbicides to phytoplankton.** *Natl. Tech. Inform. Serv.* PB-250 497; 71p.; 1975. (42 references)

The current trend to remove phosphorus from detergents has resulted in the replacement of phosphate-based products with inadequately tested carbonate-based detergents. Additional studies were conducted on the effects of the phenoxy herbicides 2,4-D and silvex on phytoplankton. Carbonate detergents at low concentrations stimulated diatom growth. At higher carbonate concentrations, the increased alkalinity favored bluegreen algae over the diatoms. In comparing phytoplankton cultures treated with carbonate and phosphate detergents, the carbonate products caused the least growth reduction to bluegreen algae and were found to be more toxic to diatoms at lower concentrations. Diatoms were not affected by silvex acid at 140 ppm; however planktonic green algae were affected at concentrations as low as 35 ppm. Growth of the phytoplankters, *Scenedesmus, Ankistrodesmus*, and *Pediastrum* was markedly decreased by 110 and 220 ppm 2,4-D acid, a sensitivity not previously noted by other

researchers. Neither herbicide, however, caused complete mortality, even at highest concentrations. (Author abstract by permission)

78-1406. Smith, P. W. ; Robinson, C. P.; Zelenski, J. D.; Endecott, B. R. (Off. Aviation Med., Fed. Aviat. Adm., Washington, DC) **The role of monamine oxidase inhibition in the acute toxicity of chlordimeform.** *Natl. Tech. Inform. Serv.* AD-A045,507: 10p.; 1977. (29 references)

This paper presents data from experiments on male rats performed to determine whether drugs which interfere with central amine mechanisms would decrease the lethality of the acaricide chlordimeform (and thus be of potential value as antidotes for accidental poisoning) or increase chlordimeform lethality (and thus should be avoided by aerial applicators and others is contact with it). Neither reducing serotonin synthesis with *p*-chlorophenylalanine, reducing norepinephrine synthesis with DL-α-methyl- *p*-tyrosine nor depleting both amines with reserpine affected the lethality of chlordimeform. Likewise, blocking α-adrenergic receptors with phentolamine or the serotonergic receptors with methylsergide, or both, did not influence chlordimeform lethality. The adrenergic agonist drug phenylephrine also did not affect chlordimeform lethality. Thus, the results indicate that: (1) monamine oxidase inhibition does not play a major role in acute chlordimeform lethality; (2) none of the drugs tested shows promise in the treatment of chlordimeform poisoning, and (3) aerial applicators or others would appear to incur little or no extra risk should they be taking any of the above drugs during potential exposure to chlordimeform. (Author abstract by permission)

78-1407. Metker, L. ; Angerhofer, R. A.; Pope, C. R.; Swentzel, K. C. (Environ. Hyg. Agency, US Army, Aberdeen Proving Ground, MD) **Toxicological evaluation of 3-(phenoxyphenyl) methyl (±)*cis*, *trans*- 3-(2,2-dichloroethenyl)-2,2-dimethyl- cyclopropane carboxylate (permethrin), December 1975 - April 1977.** *Natl. Tech. Inform. Serv.* AD-A047,284, 70p.; 1977.

Toxicological evaluations of permethrin were conducted using rats, rabbits, and guinea pigs. The technical grade compound produced a mild primary irritation when applied to the intact or abraded skin of rabbits. Mild conjunctivitis was caused by application into the eyes of rabbits. Acneform dermatitis was not noted with repeated applications to the ears of rabbits. No skin sensitization was noted in guinea pigs and no photochemical irritation reaction was observed in rabbits. There is a possible toxic hazard when the compound is ingested in food or with an unsaturated oil. Oral median lethal dose for female rats was 410 mg/kg compared to 3800 mg/kg when administered with no diluent. The compound is nonmutagenic and nonteratogenic. Dermal application for 21 continuous days did not elicit any toxic signs.

78-1408. Narahashi, T. (Dep. Physiol. & Pharmacol., Med. Cent., Duke Univ., Durham, NC 27710) **In vitro methods for evaluating side effects of pesticides and toxic substances.** *Natl. Tech. Inform. Serv.* PB-260,385, 129p.; 1976.

Several skeletal muscle and smooth muscle preparations have been examined for their usefulness in evaluating the toxic effects of a variety of insecticides. The following preparations were found satisfactory for such tests: guinea pig ileum for muscarinic receptors, guinea pig heart for β-adrenergic receptors, guinea pig vas deferens for α-adrenergic receptors, frog rectus abdominis for nicotinic receptors of tonic muscle, and rat diaphragm for nicotinic receptors of phase muscle. Five carbamate insecticides, four organophosphate insecticides and chlordimeform were studied. None of the insecticides tested had any direct and potent effect on these receptors except the effect on cholinergic receptors via cholinesterase inhibition. Carbofuran, propoxur and formetanate had potent stimulating actions on the guinea pig ileum, but these effects could entirely be attributed to the accumulation of acetylcholine in the synaptic cleft as a result of cholinesterase inhibition. Thus, it can be concluded that these insecticides exert no direct action on cholinergic and adrenergic receptors. (Author abstract by permission)

78-1409. Jarvinen, A. W. ; Hoffman, M. J.; Thorslund, T. W. (Environ. Res. Lab., Duluth, MN 55804) **Toxicity of DDT food and water exposure to fathead minnows.** *Natl. Tech. Inform. Serv.* PB-265,394, 79p.; 1976.

Fathead minnows (*Pimephales promelas*) were exposed during a partial chronic toxicity test to two DDT concentrations in the water, one in the diet, and a combination of water and diet for 266 days through a reproductive period of their life cycle. Tissue-residue analyses were performed on test fish at preset intervals throughout the exposure and also on embryos, larvae at hatch, and 30- and 60-day-old progeny. The contribution of DDT from each source was monitored with gas-chromatography and liquid-scintillation techniques. The diet consisted of clams that had accumulated ^{14}C-DDT when exposed at a DDT water concentration similar to that in the high fish exposure. Higher total DDT tissue residues were accumulated from the water than from the diet. Residues contributed by dietary DDT were additive to those from the water. Mean concentration factors were 1.2 times from the diet and 100,000 times from the water. Mortality was higher in fish exposed to DDT in both water and diet than in fish exposed to only one or the other of these sources. DDT in the diet significantly reduced the probability of survival of the test fish ($P = 0.025$). Estimated maximum acceptable toxicant concentrations for DDT are 0.9 μg/l for fish exposed to DDT in the water only or 0.4 μg/l for fish exposed to DDT in both water and diet. (Author abstract by permission)

78-1410. Carlson, G. P. ; Fuller, G. C. (Dep. Pharmacol. Toxicol., Rhode Island Univ., Kingston, RI) **Fate of the organophosphate insecticide parathion in the freshwater invertebrates.** *Natl. Tech. Inform. Serv.* PB-266,711, 16p.; 1976. (43 references)

The goal of the study was to determine the toxicity

and fate of the organophosphate insecticide parathion in the freshwater crayfish *Cambarus* and snail *Viviparus malleatus* . The research was designed to measure the toxicity of this pesticide to these species in relation to their ability to take it up, metabolize it to the active metabolite paraoxon and inactive metabolites, principally *p*-nitrophenol, and finally excrete the pesticide and metabolites. The results indicate no direct danger to the snail due to parathion, but the crayfish is sensitive to parathion at levels so low that they are normally exceeded in ponds adjacent to farms following agricultural spraying with parathion. The direct effect on snails due to parathion spraying is minimal and there appears to be very little accumulation of organophosphate in exposed snail tissues; thus the danger to predator species also appears small. However, the consequences of crayfish elimination by organophosphate may be real and need investigation, while accumulation, although being investigated, would not be of importance with toxicity occurring at such a low dose. (Author abstract by permission)

78-1411. Cardwell, R. D. ; Foreman, D. G.; Payne, T. R.; Wilbur, D. J. (Envirogen. Syst., Chemico Process Plants Co., El Monte, CA 91734) **Acute and chronic toxicity of chlordane to fish and invertebrates.** *Natl. Tech. Inform. Serv.* PB-267,544, 139p.; 1977.

The acute and chronic toxicity of technical chlordane to bluegill (*Lepomis macrochirus*), fathead minnow (*Pimephales promelas*), brook trout (*Salvelinus fontinalis*), *Daphnia magna, Hyallela azteca* and *Chironomus* No. 51 were determined with flow-through conditions. The purpose was to estimate concentratons producing acute mortality and those having no effect on the long-term survival, growth, and reproduction of the various species. Whole body residues of technical chlordane components were measured in the three invertebrate species at the end of the chronic exposure tests. Concentrations of technical chlordane causing 50% mortality in 96 hr were 36.9 μg/l for fathead minnor, 47 μg/l for brook trout, and 59 μg/l for bluegill, while that causing 50% immobilization in the cladoceran, *D. magna*, was 28.4 μg/l. The amphipod, *H. azteca*, was only slightly affected at 96 hr by the chlordane concentrations tested, and the 168 hr EC50 was 97.1 μg/l. Acute mortality of midges *Chironomus* No. 51, was not successfully evaluated. With respect to the test conditions employed and life cycle stages evaluated, the lowest concentrations of technical chlordane found to cause major chronic effects were 0.32 μg/l for brook trout, 1.22 μg/l for bluegill, 1.7 μg/l for midges, 11.5 μg/l for amphipods, and 21.6 μg/l for cladocerans. (Author abstract by permission)

78-1412. Dimock, C. W. (Dep. Microbiol., Rhode Island Univ., Kingston, RI) **The effect of soluble organic matter on the utilization of phenoxy herbicides by *Pseudomonas* sp.** *Natl. Tech. Inform. Serv.* PB-268,528, 52p.; 1975. (21 references)

Eight organisms of the genus *Pseudomonas* were isolated from soil and water and used to compare the microbial degradation of the three phenoxy herbicides: 2,4-D, 2,4,5-T, and 2,4,5-TP. 2,4-D was readily attacked in a mineral salts medium by cultures adapted to this compound. This, and additional information, suggests that no carbon or energy for growth was obtained from herbicide utilization, which is characteristic of cometabolism. Intermediates such as 3,5-DCC and 2,4,5-TCP were not detected in the culture medium during this study. It was shown that increasing quantities of bacteriological peptone and beef extract increased the utilization of all three herbicides. In view of these results, it seems that the 2,4,5-T and 2,4,5-TP were oxidized more extensively than previously reported.

78-1413. Robertson, E. B., Jr. (Dep. Zool., Tennessee Univ., Knoxville, TN 37916) **The acute toxicity of four herbicides to 0-4 hour nauplii of the copepod *Cyclops vernalis* Fisher.** *Natl. Tech. Inform. Serv.* PB-269,495, 70p.; 1975. (42 references)

A study was made of the acute toxicity of four herbicides to nauplii of the copepod *Cyclops vernalis* Fisher. The herbicides used were amitrole, amitrole-T, 2,4-D, and the alkanolamine salt of 2,4-D. Tests lasted 96 hr and mortality was assessed by failure of the animals to move when touched. The nauplii were much more susceptible to amitrole-T than to amitrole; incipient lethal levels for these compounds were 2.32 ppm and 221 ppm, respectively. The free acid of 2,4-D was more toxic to the nauplii than was the alkanolamine salt; the incipient lethal level was 8.72 ppm for the free acid and 14.20 ppm for the salt.

78-1414. Lavy, T. L. (Dep. Agron., Nebraska Univ., Lincoln, NE 68583) **Herbicide transport in soil under center pivot irrigation systems.** *Natl. Tech. Inform. Serv.* PB-270,777, 90p.; 1977. (61 references)

This study concerns the transport of herbicides in soil. The studies demonstrated that plants effectively compete for the available herbicide in soil solution. Thus plants play a role in preventing water from percolating through the soil profile and in removing phytotoxic materials from the water. A centrifugal technique was developed to remove low levels of moisture from a soil to allow the researcher to observe the concentration of herbicide present in the soil solution available to a growing plant. Atrazine dissipated rapidly under sandy irrigated conditions, due primarily to non-biological degradation. The fraction of atrazine free to more in a moist soil environment can be increased by increasing the soil moisture content or by decreasing the salt content of the soil solution. Comparisons between sulfate ion, atrazine and picloram showed the sulfate ion to be most mobile.

78-1415. Carcinog. Program, Div. Cancer Cause & Prev., NCI, Bethesda, MD 20014 **Report on carcinogenesis bioassay of heptachlor.** *Natl. Tech. Inform. Serv.* PB-271,967, 110p.; 1977.

Technical grade heptachlor was tested for carcinogenicity using both sexes of Osborne-Mendel rats and

B6C3F1 mice. Heptachlor was administered in the diet for 80 weeks using two separate dose levels for each sex and species. The dose levels were changed during the course of the experiment because of observable toxic effects, which led to a calculation of time weighted average doses for male rats (38.9 and 77.9 ppm) and female rats (25.7 and 51.3 ppm.) The time weighted average doses for male mice were 6.1 and 13.8 ppm, and for the females 9 and 18 ppm. The average body weights of rats treated with high doses were consistently lower than those of untreated controls while body weights of low dose rats were unaffected. Mortality was dose related for female rats and mice but not for the males of either species. However, a substantial portion of all groups of animals survived to an age at which tumors could be expected to appear. (Author abstract by permission)

78-1416. Carcinog. Program, Div. Cancer Cause & Prev., NCI, Bethesda, MD 20014 **Bioassay of chloramben for possible carcinogenicity, CAS No. 133-90-4.** *Natl. Tech. Inform. Serv.* PB-273,065, 93 p.; 1977.

A bioassay for the possible carcinogenicity of technical grade chloramben was conducted using Osborne-Mendel rats and B6C3F1 mice. The compound was administered in feed at two concentrations for 80 wk to groups of 50 animals of each species and sex. Doses for both rats and mice were either 10,000 or 20,000 ppm. Matched untreated controls (10 animals of each sex and species) were used as well as a larger amount of pool control data. In male rats, hemagiomas occurred at a significantly higher incidence in the low-dose animals than in pooled controls. This lesion was not considered to be related to the administration of chloramben since the tumor did not occur at a significantly higher incidence in the high dose group. In both male and female mice, however, the incidences of heptacellular carcinoma showed significant dose-related trends. In male mice, the incidence of heptocellular carcinoma was considered to be only marginally associated with the administration of chloramben because of the variations in the spontaneous incidence of this lesion in male mice at the tesing laboratory. Under the conditions of this bioassay, there were no tumors in Osborne-Mendel rats that were significantly related to administration of the chemical. In B6C3F1 female mice, chloramben was carcinogenic, producing heptacellular carcinomas in treated animals. (Author abstract by permission)

78-1417. Carcinog. Program, Div. Cancer Cause & Prev., NCI, Bethesda, MD 20014 **Bioassay of captan for possible carcinogenicity.** *Natl. Tech. Inform. Serv.* PB-273,475, 104 p.; 1977.

A bioassay for the possible carcinogenicity of technical grade captan was conducted using Osborne-Mendel rats and B6C3F1 mice. The compound was administered in feed at two concentrations for 80 wk to groups of 50 animals of each species and sex. In rats, the weighted average dose was either 2,525 or 6,050 ppm for both sexes. In mice, the doses for both sexes were either 8,000 or 16,000 ppm. Ten animals of each species and sex were placed on test as matched controls. In female rats, a positive dose related trend in incidence of adrenal cortical adenoma and carcinoma as well as a C-cell adenoma of the thyroid was found but these were not statistically significant and are believed to have been spontaneous in origin. In mice, the incidences of polypoid carcinoma (adenocarcinoma in adenomatous polyp) of the duodenum were statistically significant. When the incidences of adenomatous polyp were combined with those for polypoid carcinoma, the tests for male mice indicated a substantial increase in significance. It is concluded that under the conditions of this bioassay, tumors in the duodenum of B6C3F1 mice were associated with treatment with captan, but there was no convincing evidence that the tumors observed in Osborne-Mendel rats were related to treatment. (Author abstract by permission)

78-1418. Carcinog. Program, Div. Cancer Cause & Prev., NCI, Bethesda,MD 20014 **Bioassay of lindane for possible carcinogenicity.** *Natl. Tech. Inform. Serv.* PB-273,480/4GA, 99 p.; 1977.

A bioassay of lindane for possible carcinogenicity was conducted using Osborne-Mendel rats and B6C3F1 mice. The compound was administered for 80 wk in feed at two dose levels to groups of 50 animals of each species and sex. The time weighted average doses for male rats were 236 or 472 ppm; for female rats 135 or 270 ppm and for all mice 80 or 160 ppm. Matched controls of 10 untreated animals of each species and sex and pooled control data were used. In rats, no tumors occurred at a statistically significant incidence in the treated groups of either sex. In mice, the incidence of hepatocellular carcinoma in low-dose males was significant when compared with that in the pooled controls but this is insufficient to establish the carcinogenicity of lindane. It is concluded that under the conditions of this bioassay, lindane was not carcinogenic for Osborne-Mendel rats or B6C3F1 mice.

78-1419. Ahearn, D. G. ; Crow, S. A.; Cook, W. L. (Dep. Biol., Georgia State Univ., Atlanta, GA 30303) **Microbial interactions with pesticides in estuarine surface slicks.** *Natl. Tech. Inform. Serv.* PB-273,978, 32p.; 1976.

Estuarine surface films from Escambia Bay, Florida, and adjacent waters were sampled, using the membrane adsorption technique to enumerate microbial populations. Samples of the upper 10 μm of estuarine surface films yielded microbial populations up to 10^6/ml or 10^5/cm^2. These populations were 10 to 100 times greater than those in waters deeper than 10 cm. Predominant bacteria in surface films as isolated on marine agar were motile, nonpigmented, gram-negative rods. Colony-forming units of yeasts and molds on mycological agar prepared with 50% seawater were found in concentrations to 10^4/ml or 28/cm^2. The predominant surface film isolates from marine agar were proteolytic and amylolytic but exhibited only weak to negligible hydrocarbonoclastic and lipolytic activities. A greater proportion of

the surface-film bacteria, as compared to those at 10 cm depth, were capable of growth on fresh-water media. With selective isolation media, amylolytic and lipolytic bacteria appeared to comprise a more significant proportion f the total population. Twenty-one representative bacteria, yeasts, and filamentous fungi from initial sampling of surface microlayers were tested for the effects of selected pesticides on utilization of various substrates. One bacterium was sensitive to PCB formulations. In subsequent studies with 53 isolates representative of more diverse physiological groups, *o*-chloro naphthalene, PCB 1016, and pentachlorophenol were inhibitory to a large portion of the isolates, and heptachlor, biphenyl, pyrene, and PCB 1016 significantly reduced hexadecane utilization. (Author abstract by permission)

78-1420. Piotrowski, J. K. (NIOSH, Cincinnati, OH 45226) **Exposure tests for organic compounds in industrial toxicology.** *Natl. Tech. Inform. Serv.* PB-274-767, 148p.; 1977. (400 references)

This report is a monograph reviewing the actual situation and trends in the development of exposure tests for the more important organic cmpounds in industrial toxicology. The topics covered are: absorption routes; biotransformation; metabolic and excretion kinetics; exposure tests on volunteers in experimental conditions; benzene; toluene; xylene; ethylbenzene; styrene; phenol; aniline; nitrobenzene; benzidine; trichloroethylene; tetrachloroethylene; carbon disulfide; parathion; fenitrothion; DDT; aliphatic alcohols; formaldehyde; acetone; aliphatic alcohol esters; lower chlorinated hydrocarbons; aromatic nitro compounds and amino compounds. (Author abstract by permission)

78-1421. Dorough, H. W. (Dep. Entomol., Kentucky Univ., Lexington, KY 40506) **Metabolism of carbamate insecticides.** *Natl. Tech. Inform. Serv.* PB 266,223, 257p.; 1977.

Results of studies conducted to determine the metabolic fate of carbamate insecticides and its toxicological significance are presented. Methomyl metabolism in rats was investigated in detail as was croneton (ethiofencarb) in the rat, cow, pig and chicken. Carbaryl and carbofuran were administered to rats endotracheally either as aerosols or as componens of tobacco smoke and their fate determined. Carbaryl and nitrosocarbaryl were among a series of pesticides assayed for mutagenic/carcinogenic activity using the Ames assay system. In addition, a study was conducted to determine if the in vitro metabolism of carbaryl under conditions of the Ames assay was representative f that which occurs in vivo. Respiratory ^{14}C-carbon dioxide from carbonyl-labeled carbamates was evaluated as a technique for determining the effects of various factors on the metabolism of carbamate insecticides. Carbaryl and certain of its analogs were used in studies designed to define the role of glutathione conjugation in carbamate metabolism in rats. Conjugated and bound residues of carbaryl, carbofuran, Croneton and aldicarb formed by plants were administered orally to rats and their bioavailability ascertained. Biliary excretion and enterohepatic circulation were considered in addition to urinary and fecal elimination. (Author abstract by permission)

78-1422. Shibata, T. (Dep. Public Health, Fac. Med., Kobe Univ., Kobe, Japan) **[Experimental studies on the dynamic aspects of BHC and PCB *in vivo*].** *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 32(6): 736-746; 1978. (30 references) (Japanese)

The accumulation of β-BHC and its transfer to the next generation of carp, mice, and rats were studied. When carp were bred in water containing 0.05 μg BHC/ml water, the BHC concentration in the carp increased until reaching maxima of about 25 μg/g β-BHC, 13 μg/g α-BHC, and 12 μg/g α-BHC. BHC residues in the carp then decreased. The maximum β-BHC concentration in carp was approximately 500 times the concentration in water. Three hr after mice were given oral doses of 500 μg/g β-BHC and γ-BHC, the intestine contained 263 μg β-BHC. No β-BHC was detected in the intestine after 30 days. The remainder of the body contained 229 μg β-BHC after 3 hr and 15 μg β-BHC after 40 days. The intestine contained 139 μg γ-BHC 6 hr after administration, and no γ-BHC was detected after 5 days. When β-BHC was administered to pregnant rats, the rate of placental transfer was estimated to be about 40%. When β-BHC was administered to rats after delivery, the rate of transfer through lactation was 64%. The transfer rate of β-BHC stored in the fat of rats through lactation wwas 85.1%.

78-1423. Konno, N. ; Kinebuchi, H. (Sch. Public Health, Fukushima Med. Coll., Fukushima, Japan) **[Phosvel level in blood and adipose tissue of hens after a single oral dose.]** *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 25(1): 1-5; 1978. (10 references) (Japanese)

Phosvel (leptophos) was administered po to one group of 21 adult hens (age 24 mo) at 50 mg/kg and to another group of 21 hens (age 24 mo) at 250 mg/kg. Three hens of each group were sacrificed to determine the Phosvel levels in blood and adipose tissue at 1, 3, 6, 12, 24, 48 and 72 hr after administration. The maximum level in blood was recorded at 1 to 3 hr after administration. The average peak value was 121 ppb in the 50 mg/kg group and 805 ppb in the 250 mg/kg group. The concentration disappeared quickly, becoming less than 20 ppb at 24 hr after administration. The level in adipose tissue increased linearly with the dose and showed maximum value at 24 hr in both groups, the average peak value was 2.53 ppm in the 50 mg/kg group and 8.60 ppm in the 250 mg/kg group. The amount of Phosvel translocating to adipose tissue was nearly proportional to the oral dose. Although the level in blood increased rapidly after po administration, its diminuation was also rapid with a short residual time period. Phosval levels were determined by gas chromatography.

78-1424. Robinson, K. M. ; Yarbrough, J. D. (Dep. Zool., Mississippi State Univ., Mississippi State, MS 39762) **Liver response to oral administration of mirex in rats.** *Pestic. Biochem. Physiol.* 8(1): 65-72; 1978. (24 references)

The response of the liver to oral administration of mirex in rats was studied. Single oral doses were given at 50, 100, and 150 ppm levels. These simulated liver enlargement

at an initial rate which was dose independent. At 100 ppm an apparent maximum response of liver hypertrophy was noted along with changes in the liver concentration of lipid, and nucleic acids. Protein, glycogen, and dry weight concentrations remained essentially unchanged. Hepatic and serum levels of lactate dehydrogenase, glutamic pyruvic transaminase, and glutamic oxaloacetic transaminase activity did not indicate that mirex had caused liver cell damage. Sex hormones were also involved in the magnitude of the liver response. Mirex residues were significantly correlated with hepatic lipid concentration in male, but not in female rats.

78-1425. Komissarenko, V. P. ; Chelnakova, I. S.; Mikosha, A. S. (Lab. Pathophysiol., Kiev Sci. Res. Inst. Endocrinol & Metab., Kiev, USSR) **Aktivnost' glutationreduktazy v nadpochechnikakh i pecheni sobak pri vvedenii *o,p'*-DDD, pertana i AKTG. [The activity of glutathione reductase in the adrenal glands and the liver of dogs following the administration of *o,p'*-DDD, perthane and ACTH.]** *Probl. Endokrinol.* 24(1): 95-98; 1978. (10 references) (Russian)

The effects of *o,p'*-DDD (TDE) and Perthane (1,1-dichloro- 2,2-*bis* (*p*-ethylphenyl)- ethane (ethylan) on the glutathione reductase activity of the adrenal cortex and liver were studied in male dogs. Group 1 (9 dogs) received 50 mg/kg/day of *o,p'*-DDD po for 10 days, group 2 (7 dogs) was treated with equal doses of Perthane for 10 days, and group 3 (5 dogs) received a single 50 mg/kg dose of *o,p'*-DDD 24 hr before sacrificing. Both *o,p'*-DDD and Perthane increased the glutathione activity of the adrenal cortex significantly. The glutathione reductase activity (per mole of $NADPH_2$/min/mg of protein) of the hemogenate was 11.0 in group 3, 12.1 in group 1, and 19 in group 2 versus 7.9 in the intact controls. The activities measured in the cytoplasm of the cells were 23.7 in group 1, 26.3 in group 2 and 15.9 in group 3 vs 11.7 in the controls. Perthane and *o,p'*-DDD, administered in the same doses for 10 days, had no significant effect on the glutathione reductase activity of the liver.

78-1426. Karel, A. K. ; Saxena, S. C. (Toxicol. Lab., Dep. Zool., Univ. Rajasthan, Faipur, India) **Investigations on the acute toxic effect of pyrethrum on various haematological aspects of *Meriones hurrianae* Jerdon, the Indian desert gerbil.** *Pyrethrum Post* 13(2): 61-70; 1975. (5 references)

Healthy adult gerbils were injected with test solutions containing pyrethrins prepared from pyrethrum extract diluted with petroleum ether to produce concentrations of 1.0, 2.0, 3.0, and 4.0% pyrethrin. A drop in hematocrit occurred in both treated and control gerbils up to 1 wk after treatment. The greatest drop in control gerbils (43% to 34%) was observed in males. Hematocrit dropped to about 29% in male gerbils treated with 2.0% pyrethrins and returned to normal 28 days after treatment. During wk 1 after treatment, red blood cell (RBC) count also decreased in both treated and control gerbils. The greatest decrease in RBC's of controls ($7.2 \times 10^3/mm^3$ to about $5.8 \times 10^3/mm^3$) was observed in female gerbils. RBC count dropped to about $4.8 \times 10^3/mm^3$ in male gerbils treated with 4.0% pyrethrins. Within 28 days, RBC counts had returned to or exceeded their original values in all groups. In female gerbils, the mean corpuscular volume (MCV) increased to a maximum within the first 3 days, except in the group treated with 4.0% pyrethrins. The greatest increase in untreated female gerbils was from about 55 to 66 μ^3. Mean corpuscular volume increased to 63 μ^3 in female gerbils treated with 2.0% and 3.0% pyrethrins. In female gerbils treated with 4.0% pyrethrins, MCV initially decreased from about 57 to 55 μ^3, then increased to values greater than the initial value. MCV was more variable in male gerbils. The MCV in all groups of males decreased to less than the original value within 28 days. The mean corpuscular hemoglobin (MCH) generally increased within the first three days, then decreased to values comparable with or less than the original value. In female gerbils treated with 4.0% pyrethrins, MCH initially decreased, then increased and decreased repeatedly, reaching a value comparable with the initial value. In all groups of male gerbils, mean corpuscular hemoglobin concentration (MCHC) reached a maximum within 3 days after treatment. The maximum in control gerbils was about 34%, and in gerbils treated with 4.0% pyrethrins it was 30%. In female gerbils MCHC decreased in the first 3 days, then increased, then decreased to values comparable to, or lower than, the original value. The initial minimum was about 30% in untreated females, and about 26% in females treated with 3.0% pyrethrins.

78-1427. Zawadzka, T. (Res. Inst. Food & Commod., Natl. Inst. Hyg., Warsaw, Poland) **Wplyw wybranych pestycydow na aktywnosc dehydratazy weglanowej *in vivo*. cz. I. dzialanie preparatoww zinebu i manebu na aktywnosc enzymu we krwi szczurow. [The effect of selected pesticides on the activity of carbonic anhydrase *in vivo*. Part I. The effects of zineb and maneb preparations on the enzyme activity in rat blood.]** *Rocz. Panstw. Zakl. Hig.* 28(5): 435-439; 1977. (19 references) (Polish)

A study was made of the effect of two single doses of Cynkotox, given at 520 and 52 mg/kg calculated as zinc ethylene bis thio carbaminate on the activity of carbonic anhydrase in rat blood. Similar studies were conducted using Maneb 80 at doses of 675 and 67.5 mg/kg calculated as manganese ethylene bis dithio carbamate. The enzyme was measured at 2, 3, 4, 5, and 6 hr after dosing. Luxan Maneb 80 and Cynkotox at higher doses decreased the carbonic anhydrase activity in rat blood. Even after administering lower doses, Maneb 80 luxate still significantly inhibited the activity of the enzyme.

78-1428. Andryukin, A. A. (Dept. Ther., I. M. Sechenov First Moscow Med. Inst., Moscow, USSR) **Izmeneniya serdechno-sosudistoy sistemy pri otravlenii fosfororganicheskimi soedineniyami. [Changes in the cardiovascular system in poisoning with organophosphorus compounds.]** *Sov. Med.* (1): 107-111; 1978. (6 references) (Russian)

The cardiovascular status of 32 patients (22 men, 10 women, aged 18-50 yr) with acute poisoning by organophosphorus pesticides was studied. Poisoning was due to trichlor-

fon (30-100 ml) in 13 cases, to thiophos (parathion) (20-100 ml) in 10 cases, to carbophos (malathion) (100-150 ml) in 2 cases, and to dichlorvos (30 ml) in one. Twenty-three patients were hospitalized with symptoms which included vertigo, headache, nausea, emesis, psychomotor excitation, miosis, hypersalivation, excessive perspiration, bronchorrhea, clonicotonic convulsions and muscular fibrallation. Decreased cholinesterase activities (0.5-3.9 μmole/ml/min), slight tachycardia (77 min), reduction of the stroke volume (53 ml), min volume (4.36 l/min) and of the cardiac index (2.24 l/min/m^2), and of the plasma volume (50 volume), and the circulating blood volume (2.42 l/m^2), and increase of the vascular tonus were observed in the patients in Stages I-II. During Stage III, and especially at time of shock, progressively increasing hypovolemia, development of cardiac insufficiency and derangement of the regulation of the vascular tonus caused deterioration of the hemodynamics.

78-1429. Apostol, S. (Inst. Med. Pharm., Iasi, Rumania) **Toxicitatea etanolaminelor pentru nevertebratele acvatice. [Ethanolamine toxicity in aquatic invertebrates.]** *Stud. Cercet. Biol. Ser. Biol. Anim.* 27(4): 345-351; 1975. (10 references) (Rumanian)

The acute and chronic toxicity of mono-, di-, and triethanolamine was studied in Protozoa (*Amoeba* sp., *Paramecium caudatum, Vorticella* sp., *Bodo* sp.), Vermes (nematodes), Gastropoda (*Planorbus* sp.), *Daphnia magna*, and insects (*Aedes* sp, larvae) by determining the survival time. The acute action of the compounds began with a concentration of about 100 mg/l, and the chronic action at < 1 mg/l. Among the microscopic invertebrates Amoeba and ciliated protozoa, and among the macroscopic invertebrates *Daphnia magna* were found to be most sensitive to the ethanolamines. The toxicity of the compounds declined from monoethanolamine to triethanolamine. The findings indicate that the MAC values determined for these compounds in bodies of water on the basis of tests with homiothermic species should be reduced in view of the higher sensitivity of invertebrate species which play an important role in the self-purification of bodies of water.

78-1430. Khera, K. S. ; Shah, B. G. (Bur. Chem. Saf., Health & Welfare Canada, Ottawa, Ont., Canada) **Failure of zinc acetate to reduce teratogenicity of ethylenethiourea in pregnant rats.** *Teratology* 17(2): 48A-49A; 1978.

Ethylene bis dithio carbamate fungicides, their degradation, and a probable metabolic product, ethylene thiourea (ETU), and maternal zinc deficiency during pregnancy, have all produced strikingly similar anomalies in rats. Mechanism of teratogenic p_tion of maneb (one of the fungicides), deduced from protective effects observed following simultaneous dosing of zinc acetate and maneb, has been attributed to its chelating and hence zinc depleting activity (Teratol., *14*, 171-184). Whether a similar mode of action can be assigned to ETU, was investigated. Mated females from five of the ten experimental groups were fed control diet for the entire period of pregnancy. The dams from the remaining groups also were similarly fed except that their diet contained zinc acetate from the 11th to 14th day of pregnancy to give a dose of 120 mg/kg body weight/day. On the 13th day of pregnancy, one group each from the control and zinc fed dams, was given no treatment, 0 (distilled water), 80, 120 or 160 mg ETU/kg, sc. The dams were necropsied either 3 hr post-injection to determine zinc levels in the conceptus and maternal serum or later at term to determine the incidence of external, visceral or skeletal anomalies. The results clearly indicated that zinc acetate was ineffective in reducing ETU-induced teratogenicity, and zinc levels in the conceptus and maternal serum were unaltered upon feeding zinc acetate or injecting ETU. [At the Eighteenth Annual Meeting of the Teratology Society.] (Author abstract by permission)

78-1431. Grabowski, C. T. (Dep. Biol., Coral Gables, FL) **ECG analysis of effects of mirex on cardiovascular physiology of rat fetuses.** *Teratology* 17(2): 34A; 1978.

Sperm-positive rats were incubated daily with mirex (5, 6, 7 or 10 mg/kg in 0.5 cc of oil on days 8-1 to 15-1/2). Controls were untreated or simply oil-fed. ECG's were obtained from 366 fetuses, 18-1/2 days old (100 untreated controls, 50 oil-fed controls and 216 mirex-fed). Each was also weighed and examined for edema. Swollen embryos were rated on a scale of 1 (slight edema under chin) to 5 (rotund, 3 mm of edema across back). ECG's were evalvated for rate of heart beat, regularity of beat, PR intervals and other features. Mirex-exposed fetuses often exhibited tachycardia, enlarged PR intervals (1st degree heart block) and missing ventricular beats (2nd degree heart block). The rapid heart beat correlated with degree of swelling. The rate jumps from 150/min in controls to 180 in moderately swollen fetuses and 224 in grossly swollen ones. The frequency of 1st degree heart block ranged from 3% in the 5 mg/kg group to 39% in the 10 mg/kg group. The frequency of 2nd degree heart block ranged from 4 to 8% in the various mirex treated groups. These data suggest that edematous fetuses are suffering from congestive heart failure due to hypervolemia. This condition appears to resemble that of fetal hydrops in humans. This study demonstrates the usefulness of fetal ECG's in evaluating developmental toxicity. [At the Eighteenth Annual Meeting of the Teratology Society.] (Author abstract by permission)

78-1432. Courtney, K. D. ; Andrews, J. E. (EPA, Research Triangle Park, NC) **Mobilization of hexachlorobenzene (HCB) during gestation from maternal tissues to the fetus.** *Teratology* 17(2): 42A; 1978.

Hexachloro benzene (HCB) was administered to pregnant CD-1 mice either before implantation (days 0 to 5) or after implantation (days 6 through 11 or 6 through 16). Mice were sacrificed on day 12 or 17 and maternal tissues and fetuses assayed for HCB. There was no significant difference between the HCB concentrations in the blood, liver or fat of the mice treated before implantation compared to the respective values for the tissues of the mice treated after implantation (day 6 to 11). On day 17, the tissues of the mice

treated before implantation (6 treatments) had approximately 25% of the HCB concentration as the respective tissues of the mice treated daily after implantation (11 treatments). Mice treated on days 6 through 11 at 10 or 100 mg/kg HCB had fetal concentrations of 0.76 or 7.16 ppm HCB, respectively. Mice treated on days 0 through 5 with 10, 50 or 100 mg/kg HCB had fetal concentrations of 1.15, 3.46 or 7.55 ppm HCB, respectively. The corresponding placental values were 2.04, 14.36, and 3.79, 9.36 and 20.54 ppm HCB respectively. The placental values were always higher than the fetal values. Mice treated with 10 or 50 mg/kg HCB on days 6 through 16 of gestation and assayed on day 17 had 3.68 and 19.60 ppm HCB, respectively. Mice treated with 10, 50 or 100 mg/kg on days 0 through 5 and assayed on day 17 had 1.90, 3.51, and 7.22 ppm HCB, respectively. HCB was readily mobilized from maternal tissue stores to cross the placenta and be deposited in the fetuses. [At the Eighteenth Annual Meeting of the Teratology Society.] (Author abstract by permission)

78-1433. Hoberman, A. M. (Univ. Arkansas Med. Sci., Little Rock, AR) **Ultrastructural study of liver tissue from mice prenatally exposed to the cholinesterase inhibitor carbofuran.** *Teratology* 17(2): 41A; 1978.

Liver tissue from offspring of mice given 0, 0.05 or 0.1 mg/kg/day of the cholinesterase inhibitor carbofuran was examined by electron microscopy. Pregnant F_2 hybrid mice derived from an original cross of female C57 BL/6 x male A/Jax, female C3 H/Hc x male Balb/C were given carbofuran orally throughout gestation. The assigned mg/kg dose of technical grade carbofuran was delivered daily in a measured mixture with peanut butter which the mice ate freely. Following behavioral, endocrine and immune function tests, offspring were sacrificed by decapitation at 15 months of age. Tissue was fixed by immersion in buffered 2.5% glutaraldehyde and post-fixed in 1% osmium. Electron microscopic examination revealed a dose-related increase in the number of debris-filled sinusoids and number of active phagocytizing Kupffer cells. Livers from offspring of control mothers showed mostly empty sinusoids with few and apparently inactive Kupffer cells. Livers from the 0.05 mg/kg/day carbofuran group showed more debris in the sinusoids and an increased number of phagocytes. Livers from the 0.1 mg/kg/day carbofuran group consistently showed large numbers of sinusoidal casts and active Kupffer cells. This debris was composed of free ribosomes, smooth endoplasmic reticulum and proteinaceous material. Active extrusion of hypatocytic materials into the sinusoidal space was observed denoting an active process of elimination of cellular material. The increased activity of the Kupffer cells is probably a response to such exocytotic phenomena. These ultrastructural changes will be correlated with dysfunction found in the endocrine and immune systems. [At the Eighteenth Annual Meeting of the Teratology Society.] (Author abstract by permission)

78-1434. Lu, M. H. ; Staples, R. E. (Lab. Environ. Toxicol., NIEHS, Research Triangle Park, NC 27709) **Teratogenicity of ethylenethiourea and thyroid function in the rat.** *Teratology* 17(2): 171-178; 1978. (34 references)

Ethylenethiourea (ETU) was given by gavage at a dose of 40 mg/kg/day from days 7 through 15 of gestation to hypothyroid and euthyroid rats, and to rats given exogenous thyroxine, to determine whether ETU teratogenicity occurs through alteration of maternal thyroid function. At sacrifice on day 20 of gestation 84-100% of the fetuses in all groups given ETU were malformed regardless of the thyroid status of the dams. Ten percent of the fetuses of dams thyro parathy roidectomized at 75 days of age that were not given ETU were malformed; no malformations were noted among the fetuses of the other groups not given ETU. Hence, ETU was found to induce teratogenicity in rats but not through alteration of maternal thyroid status. In addition, it was determined that ETU lowered serum thyroxine concentration, that hypothyroidism itself increased the background level of malformations in the rat, and that hypothyroidism qualitatively and quantitatively increased the incidence of specific malformations after ETU administration. (Author abstract by permission)

78-1435. Boyer, A. C. (Biol. Sci. Res. Cent., Shell Dev. Co., Modesto, CA 95352) **Factors which affect the *in vitro* inhibition of human plasma cholinesterase.** *Toxicol. Appl. Pharmacol.* 43(3): 475-483; 1978. (7 references)

Human blood plasma was used as a source of tissue to study the effect of plasma factors on the *in vitro* inhibition of plasma cholinesterase by dichlorvos (2,2-dichlorvinyl dimethyl phosphate). The degradation of [^{14}C]dichlorvos in plasma does not follow first-order kinetics. Evidence was presented which strongly indicated that the departure from first-order kinetics was due primarily to the reversible sorption of dichlorvos to nondegrading components of the plasma. A first-order rate constant of 0.0502/min was, therefore, approximated. It was found to be useful in giving fairly steady-state concentrations of dichlorvos, when the dichlorvos was continuously infused into the plasma. By using steady-state concentrations of dichlorvos, it was possible to measure the inhibition of plasma cholinesterase at low concentrations of dichlorvos over extended incubation times. The observed inhibition departed from the pseudo-first-order kinetics expected of a vinyl phosphate anticho linesterase agent. Reversible and irreversible inhibition of the enzyme were found to play important roles in determining the amount of inhibition observed. (Author abstract by permission)

78-1436. Eroschenko, V. P. (Dep. Biol. Sci., Univ. Idaho, Moscow, ID 83843) **Alterations in the testes of the Japanese quail during and after the ingestion of the insecticide Kepone.** *Toxicol. Appl. Pharmacol.* 43(3): 535-545; 1978. (29 references)

Six-week-old Japanese quail males were fed 200 ppm Kepone (chlordecone) for exactly 42 days, at which time noncontaminated diet was substituted. A number of birds were terminated on Day 42 of Kepone ingestion and also at about 10-day intervals for 60 days after Kepone was withdrawn from the diet. Structural changes in the testes and their excur-

rent ducts were studied both during and after Kepone ingestion. Continuous ingestion of Kepone produced both enlarged (fluid-filled) and atrophic testes. In enlarged testes, the seminiferous tubules were extensively dilated, the germinal epithelium was severely disrupted, and sperm production was affected. In atrophic testes, the seminiferous tubules were reduced, the spermatogenesis appeared suppressed, and the germinal epithelium contained abnormal sperm. The excurrent ducts contained either few sperm or were packed with degenerating cellular debris. After Kepone was withdrawn from the diet, structural reparations, not always bilateral, were recorded in most testes and sperm concentration increased in their excurrent ducts. In other samples, degeneration and necrosis were recorded in the testes and the excurrent ducts. It is concluded that after elimination of Kepone from the diet, structural reparations were recorded in most, but no all, testes and ducts. However, due to the permanent damage observed in other testes and their ducts, it is also concluded that the reproductive capabilities of numerous birds will be severely limited if not completely abolished.

78-1437. Story, D. L. ; Freedland, R. A. (Dep. Physiol. Sci., Sch. Vet. Med., Univ. California, Davis, CA 95616) **The effect of DDT feeding on gluconeogenesis in isolated heptacytes from starved rats.** *Toxicol. Appl. Pharmacol.* 43(3): 547-557; 1978. (37 references)

The effects of feeding DDT on liver gluconeogenesis were studied in isolated hepatocytes. Rats were fed 1000 ppm *o,p'*-DDT for 2 weeks and starved for 48 hr. Food intake and weight gain were not affected by DDT feeding. Gluconeogenic rates were similar in hepatocyes from rats fed control and DDT diet when 10 m*M* glycerol, 10 m*M* alanine, and 10 m *M* fructose were used as substrates. Gluconeogenesis from 10 m*M* lactate-pyruvate (9:1) and 10 m*M* lactate was decreased in hepatocytes from rats fed DDT. Stimulation of gluconeogenesis from 10 m*M* lactate-pyruvate by 2 m*M* butyrate was similar in hepatocytes from rats fed control and DDT diet; however, the absolute rates of gluconeogenesis from lactate-pyruvate plus butyrate were significantly decreased in hepatocytes from DDT-fed animals compared to controls. The activity of pyruvate carboxylase and intact mitochondrial CO_2 fixation was not different in livers from DDT and control fed animals. Phosphoenol pyruvate carboxykinase activity was statistically lower in livers from rats fed DDT but this decrease was not sufficient to account for the decreased rate of gluconeogenesis. Ketogenic rates were similar in hepatocytes from DDT and control fed rats in the absence or presence of 2 m*M* oleate or 2 m*M* oleate plus 10 m*M* lactate-pyruvate. The redox state was more oxidized in the mitochondria of hepatocytes from DDT fed animals as assessed by the β- hydroxy butyrate: acetoacetate ratio. It was concluded from this study that DDT feeding inhibits gluconeogenesis from lactate between pyruvate and phosphoenol pyruvate. (Author abstract by permission)

78-1438. Hawkes, C. L. ; Norris, L. A. (Rocky Mountain For. & Range Exp. Stn., Forest Res. Lab., For. Serv., USDA, Rapid City, SD 57701) **Chronic oral toxicity of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD) to rainbow trout.** *Trans. Am. Fish. Soc.* 106(6): 641-645; 1977. (17 references)

Rainbow trout were fed a diet supplying an average of 32 fg, 36 pg, or 21 ng TCDD/g fish (frozen dry weight) daily. Growth in side view area of the fish did not differ significantly except for those fed the highest dose, which lost an average of 10 mm^2/fish in 30 days. These fish lost an average of 0.01 g/fish in 30 days, while other groups gained 0.75 to 0.78 g/fish. After 105 days, control fish had gained an average of 1.96 g/fish; fish fed the lowest dose had gained an average of 1.90 g/fish, and fish fed the intermediate dose gained an average of 2.08 g/fish. Fish fed the highest dosage weighed about 2.1 g at the start of the experiment and about 2.4 g after 9 days. Weights of these fish then began to decrease. Fish in all other groups continued to gain weight until at least about 80 days of feeding. After this time the rate of weight gain leveled off, but the fish did not lose weight. Tissues of control fish and fish fed the lowest dose contained 475 pptr TCDD or less. Tissues of the fish fed the intermediate dose contained 1.573 ppb TCDD, and those of the fish fed the highest dose contained 1.38 ppm TCDD.

78-1439. Warlen, S. M. ; Wolfe, D. A.; Lewis, C. W.; Colby, D. R. (Natl. Mar. Fish. Serv., Atlantic Estuarine Fish. Cent., Beaufort, NC 28516) **Accumulation and retention of dietary ^{14}C-DDT by Atlantic menhaden.** *Trans. Am. Fish. Soc.* 106(1): 95-104; 1977. (10 references)

Menhaden were fed diets containing 93, 9.0, or 0.58 ppb radioactively labeled DDT for 48 days, after which they were fed unlabeled food. After 109 days some of the fish fed the highest dose of DDT were starved for 33 days. Uptake of DDT was a linear function of time. At the lowest dose no uptake was evident for the first three days. After 48 days uptake had increased to about 1.1 ppb DDT at this dosage level. After feeding of DDT was stopped, the logarithm of the amount of DDT remaining was a linear function of time. At the lowest dosage, DDT concentrations had decreased to about 0.1 ppb DDT by 150 days. Growth of the fish was unaffected by DDT exposure and starvation did not significantly affect retention of ^{14}C-DDT. DDT was only detected once in detritus from the tank containing control fish, at 1.1 ppb. When fish were being fed DDT, DDT concentrations in detritus from the experimental tanks ranged from 1.0 ppb from the tank where the fish were exposed to the lowest level to 47.0 ppb from the tank where the fish were exposed to the highest level. Several days after the tanks were cleaned and fish were returned to unlabeled food, detritus from the tanks where fish had been exposed to the lower levels contained less than 1.0 ppb DDT. Detritus from the tank where fish had been exposed to the highest level contained as much as 3.0 ppb DDT.

78-1440. Rye, R. P., Jr. ; King, E. L., Jr. (Hammond Bay Biol. Stn., US Fish & Wildl. Serv., Millersburg, MI 49759) **Acute toxic effects of two lampricides to twenty-one freshwater invertebrates.** *Trans. Am. Fish. Soc.* 105(2): 322-326; 1976. (9 references)

The 24 hr LC50 of two lampricides, Bayer 73 (clonitralid) and a mixture of TFM and 2% Bayer 73, was determined for turbellarian, aquatic earthworms (*Tubifex tubifex* and *Lumbriculus inconstans*), leeches, daphnids, isopods, scuds, crayfish, stoneflies, dragonflies, water boatmen, nonburrowing mayflies, burrowing mayflies, net-building caddisflies, case-building caddisflies, blackflies, snipeflies, dobsonflies, snails (*Physa* species and *Pleurocera* species), clams, and rainbow trout. Each species were exposed to four to six concentrations of each susstance. The highest concentrations used were 50 mg/l Bayer 73 and 100 mg/l for the mixture. LC50 values for Bayer 73 ranged from 0.034 mg/l for *Tubifex tubifex* to over 50.9 mg/l for dragonflies, water boatmen, crayfish, snipeflies, and dobsonflies. LC50 values for the mixture ranged from 1.5 mg/l for turbellarians to over 100.0 mg/l for crayfish, dragonflies, snipeflies, and dobsonflies. These values are all higher than the LC50 for lampreys, 0.78 mg/l. Both lampricides gave relatively low slope function values for regression lines for all organisms, indicating a narrow range between concentrations causing no mortality and concentrations causing 100% mortality.

78-1441. Lue, K. Y. ; de la Cruz, A. A. (Dep. Zool., Mississippi State Univ., P.O. Drawer Z, Mississippi State, MS 39762) **Mirex incorporation in the environment: toxicity in two soil macroarthropods and effects on soil community respiration.** *Water, Air, Soil Pollut.* 9(2): 177-191; 1978. (32 references)

The effects of mirex on two species of non-target soil animals, the land isopod *Armadillidium vulgare* and the soil millipede *Oxidus gracilis*, were studied as an index of the action of mirex on the total soil community metabolism. The median knockdown dosage and median lethal dosages for *A. vulgare* at 10 days exposure were 11.6 ppm and 35.2 ppm, resp., and for *O. gracilis*, 5.4 ppm and 198.7 ppm, resp. Poisoned animals showed increased oxygen uptake after two to three days of feeding on the mirex diet. This was probably due to increased muscular activity induced by elevated oxidative metabolism. Mirex at technical concentrations showed a significant effect on soil community respiration at 100 ppm concentrations after 24 hr, but no change was noted at the higher concentrations of 500 and 1000 ppm. Soil community respiration was not affected by the addition of mirex as fire ant baits at the rates of 1:100, 1:1000, and 1:10,000 bait to soil ratio. However, oxygen uptake was elevated due to the microbial population that immediately invaded the bait material (bacteria and fungi).

78-1442. Forward, R. B., Jr. ; Costlow, J. D., Jr. (Mar. Lab., Duke Univ.,Beaufort, NC 28516) **Sublethal effects of insect growth regulators upon crab larval behavior.** *Water, Air, Soil Pollut.* 9(2): 227-237; 1978. (11 references)

The sublethal effects of insect growth regulators were studied using crab larval behavior. Both swimming speeds and phototaxis by the four larval stages of the crab *Rhithropanopeus harrisii* were monitored. Insect growth regulators used included methroprene, hydroprene, and dimiline. Larvae were reared under conditions of 20% salinity and 25 C. No effect on either parameter was noted by sublethal concentrations of methroprene. For hydroprene, swimming rates by stage I, II and III zoeae were unaffected, while a significant increase in swimming speeds was noted in stage IV zoeae at concentrations of 0.05 and 0.1 ppm. Only Stage III zoeae exposed to 0.1 ppm showed a significant decrease in the level of positive phototaxis. Dimilin was more potent, with significant increases in swimming speeds noted in Stage I, II and III zoeae, with 0.3 ppb being the lowest effective concentration. Phototaxis was altered at concentrations as low as 0.1 ppb. The concentrations which alter behavior are related to levels which are reported to control mosquitoe larvae.

78-1443. Cervelli, S. ; Nanipieri, P.; Giovannini, G.; Perna, A. (Lab. Clim. Terreno, 56100 Pisa, Italy) **Alkaline phosphatase inhibition by vinyl phosphate insecticides.** *Water, Air, Soil Pollut.* 9(3): 315-321; 1978. (8 references)

This work investigates the influence of some vinyl phosphate insecticides on alkaline phosphatase as a model to extend the results to soil organic P metabolism. As parathion and guthion, two thiophosphoric insecticides in widespread use, are hydrolyzed by alkaline phosphatase, some preliminary experiments were carried out to ascertain the possible degradation of the vinyl phosphate derivatives by the enzyme. No hydrolysis was found for all tested insecticides. These studies indicated that the interaction between soil enzyme and insecticides is more complex than that occurring in solution as tested in this work. The soil adsorbing surface influences the behavior of insecticides, and their availability to the enzyme. Interaction between the insecticides and the enzymes present inside the cell occurs if the pesticides can diffuse through the cell membrane.

78-1444. Gerstengarbe, S. (Biol. Inst. Bereichs Med., Martin Luther Univ., Halle (Saale), DDR) **Die Mutagenitaet von Dimethoat - nachgewiesen mit dem Dominanten Letaltest an der Hausmaus (*Mus musculus* L). [Mutagenicity of dimethoate observed in the dominant lethal test in house mice (*Mus musculus*.]** *Wiss. Z. Martin-Luther Univ., Halle-Wittenberg, Math.-Naturwiss. Reihe* 24(3): 87-88; 1975. (6 references) (German)

The mutagenicity of dimethoate was studied by the dominant lethal test in AB Jena/Halle inbred mice and C57 Black mice. Dimethoate was administered in 0.25 and 3% aqueous solutions ip. Some groups of males received a single sublethal dose, and others were treated with 1/12 of the sublethal dose over a 30 day period. The treated mice were mated with untreated females during the spermatogenesis. Compared with the untreated control significant increase in the resprotion rate was seen. The meiotic phases appeared to be especially susceptible, but all stages of spermatogenesis were affected. With the dose administered being the same, the mutagenic effect was stronger after administration of dimethoate in lower concentration, and also after the administration of a single sublethal dose compared with the long-term experiment. The sex ratio showed a slight shift

toward male fetuses. The findings indicate that dimethoate is a potential mutagen.

78-1445. Schiemann, S. (Biol. Inst. Bereichs Med., Martin Luther Univ., Halle (Saale), DDR) **Untersuchungen zur mutagen Wirkung von Trichlorfon auf die Hausmaus - unter besonderer Beruecksichtigung des dominanten Letaltestes. [Mutagenic effect of trichlorfon on the house mouse, with special regard to the dominant lethal tests.]** *Wiss. Z. Martin-Luther Univ., Halle-Wittenberg, Math. Naturwiss. Reihe* 24(3): 85-86; 1975. (German)

The mutagenicity of trichlorfon was studied in house mice by the dominant lethal test. Trichlorfon was administered either in the highest tolerable, single dose, or in small daily doses over a long period, with part of the animals additionally exposed to high temperature. Compared with the untreated control, increased rate of non-implanted oocytes and increased percentage of dead implants were found. While spermatids and spermatogonia were found to be especially susceptible to the effect of trichlorfon, the mutagenic effect extended over the entire spermatogenesis. Dominant lethal mutations were also induced by small daily doses. The intensity of the effect of trichlorfon on male germ cells was nearly doubled by additional exposure to high temperature. The findings indicate that trichlorfon should be regarded as a potential mutagen, and that the dominant lethal test is suitable for routine mutagenicity tests.

78-1446. Gingell, R. (Eppley Inst. Res. Cancer, Med. Cent., Univ. Nebraska, Omaha, NE 68105) **Metabolism of ^{14}C-DDT in the mouse and hamster.** *Xenobiotica* 6(1): 15-20; 1976. (12 references)

This report presents a quantitative study of several urinary metabolites of DDT after a single exposure of CF-1 mice and Syrian golden hamsters to ^{14}C-labeled DDT, and describes a new conjugate of DDA with serine. This new conjugate is reported along with the DDA-glycine, DDA-alanine, and DDA-glucuronic acid previously identified. Small amounts of nonpolar metabolites were noted in the urine. Mouse urine contained DDE, whereas this was not detected in hamster urine. The relevance of this finding to the tumorigenicity of DDT in mice, compared with its inactivity in this respect in hamsters, is discussed.

78-1447. Douch, P. G. C. ; Buchanan, L. L. (Wallaceville Anim. Res. Cent., Res. Div., Min. Agric. & Fish., Private Bag, Upper Hutt, New Zealand) **Glutathione conjugation of some xenobiotics by *Ascaris suum* and *Moniezia expansa*.** *Xenobiotica* 8(3): 171-176; 1978. (21 references)

The cestode *Moniezia expansa* and the nematode *Ascaris suum* both possess enzymes catalyzing the conjugation of glutathione (GSH) with 1-chloro- 2,4-dinitrobenzene. The GSH-*S*-aryl transferase (GSH-*S*- transferase A) was present in the cytosol of the cestode proglottids and of the nematode intestinal epithelial cells. Other tissues did not conain measurable activity. The enzymes from both species had m. w. of about 37,000 and broad pH optima around pH 8.3. Both enzymes were inhibited by cupric, ferric and mercuric ions at 1 m*M* and stimulated by cobalt ion. Neither *M. expansa* nor *A. suum* possessed measurable DDT dehydrochlorinase activity. GSH-*S*-epoxide transferase (GSH-*S*- transferase E) activity was indicated in both species; neither species effected the conjugation of bromo- or chlorobenzene. Halogenated anthelmintics were not metabolized to GSH conjugates in the helminths studied and did not inhibit GSH-*S*- aryltransferase activity towards chlorodinitrobenzene. DDT (up to 10 μM) also did not inhibit the helminths' enzyme activity. (Author abstract by permission)

78-1448. Evdokimov, E. S. ; Semenov, N. T. (Turk. Gos. Med. Inst., Ashkhabad, USSR) **Eksperimental'nye dannye o toksichnosti razlichnykh partiy khlororganicheskikh pestitsidov. [Experimental data on the toxicity of different batches of organochlorine pesticides.]** *Zdravookhr. Turkm.* 19(5): 47-49; 1975. (3 references) (Russian)

The toxicity of DDT and two different production batches of BHC was studied in 24 albino rats in a 9-13 day oral poisoning test. Group 1 was treated with 500 mg/kg doses of DDT, group 2 with 500 mg/kg doses of BHC from one batch, and group 3 with 1,000 mg/kg doses of BHC from another batch. Loss of weight, sharp increase in the segmented neutrophil count, and reduction of the lymphocyte count were seen in all animals. Neurological abnormalities observed included toxic dystrophy of the brain and internal organs, pyknotic and basophilic neurons in the brain and spinal cord, edema and demyelinization of the nerve fibers, shadow cells, slight focal glial proliferation, vacuolization of the white matter, and neuronophagia. In addition, pericellular and perivascular edema; dystrophy and focal cell proliferation in the striated muscles; bronchitis and peribronchitis with lymphoid cell infiltration and atelectasis; round-cell infiltration, sclerosis and hemosiderosis in the liver; albuminoid degeneration of the convoluted tubes in the kidney; marked hyperemia, hemolysis and hemosiderosis in the spleen; and reduced megakaryocyte count in the bone marrow were observed. The changes were most pronounced in groups 1 and 2. The pesticide residue levels found in the organs and tissues of the animals were also highest in these groups. The analysis of the preparations administered showed that the BHC given to the animals of group 2 contained 19.2% γ-isomer (lindane), while there was no γ-isomer in the preparation used in group 3. The findings indicate the possibility of considerable differences in the toxicity of pesticides from different production batches.

See also **78-1236, 78-1247, 78-1311** *and* **78-1318.**

78-1449. Hoffmann, D. ; Patrianakos, C.; Brunnemann, K. D.; Gori, G. B. (Div. Environ. Carcinog., Am. Health Found., Valhalla, NY 10595) **Chromatographic determination of vinyl chloride in tobacco smoke.** *Anal. Chem.* 48(1): 47-50; 1976. (12 references)

A chemical-analytical method has been developed for the quantitative determination of vinyl chloride (VC) in tobacco smoke. VC from the mainstream smoke is trapped on charcoal, exracted, and subsequently coverted to 1,2-dibromo- 1-chloroethane (DB-VC). The latter is enriched by column chromatography and determined by gas liquid chromatography using an electron capture detector with a high sensitivity for DB-VC. From the mainstream smoke of a popular 85-mm cigarette without filter tip, we isolated 12.2 ng of VC per cigarette. The VC content in the smoke of some domestic and foreign cigarettes and little cigars ranged from 5 to 27 ng, and that of a marijuana cigarette was 5.4 ng. The analytical data suggest that the total inorganic chloride in tobacco is a determining factor for the amount of VC in the smoke. VC may also be released into our respiratory environment during the burning of other chlorine-containing organic matter. (Author abstract reprinted by permission of the American Chemical Society)

78-1450. Ramstad, T. ; Mahle, N. H.; Matalon, R. (Anal. Lab., Dow Chem., Midland, MI 48640) **Automated cleanup of herbicides by adsorption chromatography for the determination of 2,3,7,8- tetrachlorodibenzo- *p*-dioxin.** *Anal. Chem.* 49(3): 386-390; 1977. (19 references)

An automated system is described which repeatedly uses a low-cost silica column for chemical cleanup. Its use in separating and collecting trace levels of 2,3,7,8- tetrachloro dibenzo-*p*- dioxin (TCDD) from esters of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) in commercial herbicide preparations is demonstrated. Previously, chemical cleanup by column adsorption chromatography required a newly-packed column for each sample. More than 400 runs have been achieved on a single column to date. System accuracy, as determined by checking against identical samples manually prepared, is excellent. The standard deviation for the same ester, analyzed 36 times, was 0.002 ppm at an average TCDD concentration of 0.026 ppm. There is no measurable cross-contamination from sample to sample. (Author abstract reprinted by permission of the American Chemical Society)

78-1451. Sovocool, G. W. ; Lewis, R. G.; Harless, R. L.; Wilson, N. K.; Zehr, R. D. (Health Eff. Res. Lab., US EPA, Research Triangle Park, NC 27711) **Analysis of technical chlordane by gas chromatography mass spectrometry.** *Anal. Chem.* 49(6): 734-740; 1977. (36 references)

The composition of technical chlordane has been investigated by combined gas chromatography mass spectrometry, employing a column commonly used for pesticide residue analysis. Partial or complete structure identifications have been assigned to some 45 individual constituents. Many of these compounds are simple Diels-Alder adducts of cyclopentadiene and hexachloro cyclopentadiene, with further chlorine addition or substitution. Additionally, a series of adducts derived from tetra- and pentachloro cyclopentadiene, followed by further chlorination, has been identified. Several components appear to have incorporated trichloromethyl moieties from the solvent during manufacture. Other compounds with abnormal or rearranged ring fusions have also been recognized and their unusual mass spectra have been studied. (Author abstract reprinted by permission of the American Chemical Society)

78-1452. Bertoni, G. ; Brocco, D.; Di Palo, V.; Liberti, A.; Possanzini, M.; Bruner, F. (Lab. Inquinamento Atmos. CNR, 00131 Rome, Italy) **Gas chromatographic determination of 2,3,7,8- tetrachlorodibenzo dioxin in the experimental decontamination of Seveso soil by ultraviolet radiation.** *Anal. Chem.* 50(6): 732-735; 1978. (13 references)

It is shown that gas chromatography using packed columns and EC detector is a suitable analytical tool for the analysis of environmental samples containing TCDD from Seveso, Italy. With this technique the successful experiments of photodegradation of TCDD by sunlight or artificial UV radiation have been monitored. With the purification procedure described, the minimum detectable concentration in soil samples is about 7.0 ng/kg. It is also shown that more than 90% of dioxin content is destroyed after 7 days' exposure to sunlight when soil is sprayed with a solution of ethyl oleate in xylene. (Author abstract reprinted by permission of the American Chemical Society)

78-1453. Davis, P. J. ; Jamieson, L. K.; Smith, R. V. (Drug Dynamics Inst., Coll. Pharm., Univ. Texas, Austin, TX 78712) **Determination of biphenyl and eight biphenols in microbial extracts by gas chromatography and thin-layer chromatography.** *Anal. Chem.* 50(6): 736-740; 1978. (20 references)

Thin-layer and gas chromatographic methods have been developed for the determination of biphenyl and eight of its mono- or dihydroxylated phenolic analogues in microbiological media and homogenates of the fungus, *Cunninghamelia elegans*. Biphenyl is analyzed by gas chromatography following *n*-heptane extraction of alkalinized systems. The biphenols are extracted at pH 6 with ethyl acetate and chromatographed as their hepta fluorobutyrate derivatives. Using naphthalene and 1-naphthol as internal standards for biphenyl and the biphenols, respectively, recoveries of 88% or better were achieved with all but two of the compounds analyzed while standard deviations were less than 5%. Six TLC systems were developed for separation and detection of the biphenyl compounds in microbial extracts. Chromogenic spray reagents are described which assist in distinguishing between biphenols with similar chromatographic mobilities. (Author abstract reprinted by permission of the American Chemical Society)

78-1454. Pfeiffer, C. D. ; Nestrick, T. J.; Kocher, C. W. (Anal. Lab., Dow Chem. Co., Midland, MI 48640) **Determi-**

nation of chlorinated dibenzo- *p*-dioxins in purified pentachloro- phenol by liquid chromatography. *Anal. Chem.* 50(6): 800-804; 1978. (9 references)

A rapid liquid chromatographic method for the determination of hexa-, hepta- and octachloro dibenzo-*p*- dioxins in pentachlorophenol (PCP) is described. The nonphenolic impurities are quantitatively isolated from the sample matrix by an exraction-column chroatography procedure that permits the chlorinated dibenzo- *p*-dioxins to be determined by reverse-phase partition liquid chromatography. Sample concentrates are analyzed in a 12 min separation with detection limits of 100 ppb. The entire analysis may be completed in 60 min. (Author abstract reprinted by permission of the American Chemical Society)

78-1455. Smyth, M. R. ; Osteryoung, J. G. (Dep. Microbiol., Colorado State Univ., Fort Collins, CO 80523) **A pulse polarographic investigation of parathion and some other nitro-containing pesticides.** *Anal. Chim. Acta* 96(2): 335-344; 1978. (15 references)

The polarographic behavior of parathion, its major metabolites (paraoxon and *p*-nitrophenol), and of methyl parathion, EPN and pentachloro nitrobenzene (PCNB) has been studied over a wide pH range. Differential pulse polarography is used to differentiate between parathion, *p*-nitrophenol and pentachloro nitrobenzene. An indirect determination of parathion in the presence of paraoxon can be based on their respective rates of hydrolysis in 0.5 M sodium hydroxide solution. The electrochemical behavior of these compounds has also been investigated in solutions containing tetra alkylammonium salts as the supporting electrolyte. (Author abstract by permission)

78-1456. Bush, B. ; Narang, R.; Houck, C. (Div. Lab. Res., New York State Dep. Health, Albany, NY 12237) **Semiquantitative determination of Disyston and its sulfoxide and sulfone by thin layer chromatography.** *Anal. Lett.* 10(3): 187-195; 1977. (5 references)

A method for the semiquantitative analysis of Disyston (disulfoton) also known as *O,O*-diethyl *S*-2(ethyl-thio) ethyl phosphorodithioate, a pesticide used on birch and red pine, and its by-products, sulfoxide (I) and sulfone (II), was examined. TLC, using a 0.25-mm thick layer of alumina, chloroform as the developer, and palladous chloride as indicator, was used for preliminary cleaning of red pine samples spiked with 5.0, 2.5, 1.0, 0.5, and 0.1 μg of the three compounds/g of sample. The purified extract was placed on a silica gel plate, and developed for 12 cm in a 1: 4 mixture of acetone:cyclohexane. The plate was treated with palladous chloride-calcein spray reagent. Minimum detectable quantities are on the order of 100 ng/spot, or, after cleanup, 1 μg/g of sample. This method may also be used with demeton O, demeton S (III and IV) (Systox) and their sulfoxides and sulfones.

78-1457. Bromilow, R. H. (Chem. Liaison Unit, Rothamsted Exp. Stn., Harpenden, Herts. AL5 2JQ, England) **Determination of residues of oxamyl in crops and soils by gas-liquid chromatography.** *Analyst (London)* 101: 982-985; 1976. (4 references)

A method is described for the determination of oxamyl residues in crops and soils by gas-liquid chromatography. Oxamyl is extracted with dichloromethane or acetone- dichloromethane and is separated from interfering coextractives by chromatography on a Florisil column. It is then determined by gas-liquid chromatography using oncolumn reaction with trimethyl phenylammonium hydroxide, the derivative so formed being determined by a flame-photometric detector operated in the sulfur mode. Approximately 0.5 μg of oxamyl can be detected in a 50 g sample. (Author abstract by permission)

78-1458. Farrington, D. S. ; Munday, J. W. (Dep. Ind., Lab. Gov. Chem., London SE1 9NQ, England) **Determination of trace amounts of chlorophenols by gas-liquid chromatography.** *Analyst (London)* 101: 639-643; 1976. (12 references)

Solutions of trichlorophenol, tetrachlorophenol and pentachlorophenol (PCP) are made to react with 2,4-dinitro-1-fluorobenzene in the presence of pyridine as a catalyst. The derivatives are suitable for determination by gas-liquid chromatography using an electron-capture detector. The method has been applied to the determination of chlorophenols in chicken flesh. (Author abstract by permission)

78-1459. Bronstad, J. O. ; Friestad, H. O. (Chem. Res. Lab., Agric. Univ. Norway, 1432 As-NLH, Norway) **Method for determination of glyphosate residues in natural waters based on polarography of the *N*-nitroso derivative.** *Analyst (London)* 101: 820-824; 1976. (9 references)

A differential pulse polarographic method for the determination of residues of glyphosate herbicide in natural waters down to 35 μg/l is described. The material is concentrated by chromatography on an anion-exchange column, which at the same time serves as the only cleanup step required. A polarographically active glyphosate derivative is obtained by nitrosozation performed directly in a fraction of the eluate from the column. The precision in terms of relative standard deviation varies from 22.8% at the detection limit to 2.3% at 210 μg/l. The total analysis time for one sample is 3-4 hr. (Author abstract by permission)

78-1460. Murray, R. A. (East Malling Res. Stn., Maidstone, Kent ME19 6BJ, England) **Bioassay of residues on Cox's Orange Pippin apples following summer sprays of benomyl.** *Ann. Appl. Biol.* 87(1): 47-50; 1977. (8 references)

Benomyl breaks down to carbendazim, the major fungitoxin derived from other related products such as thiophanate methyl. The residual concenrations of carbenazim from the summer sprayings and post-harvest dips of benomyl in apple orchards were measured by the use of Merck Silica Gel H chromatography plates using 3:1 ethylacetate: chloroform as the developer. The residual carbenazim was extracted

from the surfaces of Cox's Orange Pippin apples by soaking for 24 hr in ethyl acetate. After cleanup, recoveries were greater than 90%. No significant differences were found between the different summer spray periods. Residues on the order of 0.75 mg/kg of fruit were found, which is well below the FAO/WHO guidelines of 5 mg/kg.

78-1461. Miller, L. K. ; Dawes, K. P. (Dep. Bacteriol. Biochem., Univ. Idaho, Moscow, ID 83843) **Restriction endonuclease analysis for the identification of Baculovirus pesticides.** *Appl. Environ. Microbiol.* 35(2): 411-421; 1978. (26 references)

Gel electrophoresis of deoxyribonucleic acid (DNA) fragments generated by digesting the DNA genomes of nuclear polyhedrosis viruses (NPV) with restriction endonucleases provides DNA fragment patterns that may be used to identify different viruses of this group. Characteristic fragment patterns were obtained for three NPVs, which are important as biological pesticides (*Autographa californica* NPV, *Orgyia pseudotsugata* NPV, and *Heliothis zea* NPV). The DNA fragment patterns of the *A. californica* NPV genome did not change with passage through the alternate insect host, *Trichoplusia ni*. Heterogeneity in one preparation of *O. pseudotsugata* NPV was observed. The identification procedure is direct and precise. Applications of this procedure include quality control of commercial preparations of viral pesticides and screening for genetic alterations in the viruses. (Author abstract by permission)

78-1462. Cotterill, E. G. (Agric. Res. Counc., Weed Res. Organ., Yarnton, Oxford OX5 1PF, England) **Determination of 3,6- dichloropicolinic acid residues in soil by gas chromatography of the 1-butyl ester.** *Bull. Environ. Contam. Toxicol.* 19(4): 472-474; 1978. (4 references)

A method for estimating the content of 3,6- dichloropicolinic acid residues in soil by gas chromatography is presented. In earlier methods, the methyl ester of 3,6- dichloropicolinic acid was used for identification purposes, but this derivative is sufficiently volatile for losses to occur during processing. In this new method, the 1-butyl ester is used to solve this problem. The new method also gives limits of detection and recoveries similar to that of the earlier method. The use of the less volatile ester is valuable in determinations using soils with high organic matter content in which organic compounds tend to give much background interence.

78-1463. Okuno, I. ; Wilson, R. A.; White, R. E. (Wildl. Res. Cent., US Fish & Wildl. Serv., Denver, CO) **Determination of zinc phosphide in range vegetation by gas chromatography.** *Bull. Environ. Contam. Toxicol.* 13(4): 392-396; 1975. (3 references)

Zinc phosphide, a compound that hydrolyzes to phosphine gas, is a common rodenticide. A gas chromatography method sensitive to 0.01 μg/g has been developed for the analysis of zinc phosphide. A 1 g grass sample was treated with hydrochloric acid, and allowed to hydrolyze. The phosphine gas was injected into a gas chromatograph (Micro-Tek MT-220 with flame photometric detector phosphorus filter, 526 nm) and an aluminum column packed with Chromosorb 102 for analysis. Secondary samples, treated in the same manner, were used to determine recovery rates. Recoveries from spiked samples (0.01-1.6 μg zinc phosphide) ranged from 55% to 100%, depending on sample preparation.

78-1464. Tatenuma, K. (Hitachi Lab., Nippon Purle Co., Ibaraki, Japan) **[The determination of polychlorinated biphenyls by FID gas chromatography and effects of interferences.]** *Bunseki Kagaku (Jpn. J. Anal.)* 25: 837-841; 1976. (8 references) (Japanese)

Gas chromatography with flame ionization detection (FID) was used to measure biphenyl formed by dechlorination of polychlorinated biphenyls (PCB's). PCB's in samples were extracted with *n*-hexane. Vitride reagent (1 ml) was added to the extract, and the mixture was refluxed for 1 hr at 100°C. The reaction mixture was hydrolyzed, then neutralized. Silica gel column chromatography was performed before dechlorination to remove interference by chlorinated benzenes; BHC, aldrin, and biphenyl. Chlorinated benzenes were eluted in the first 30 ml of *n*-hexane, and PCB and DDE between 30 ml and 130 ml. DDE did not interfere with determination of PCB. Aldrin, BHC, and biphenyl remained on the column.

78-1465. Witek, S. ; Mierzwa, S. (Inst. Org. Technol. & Plastics, Politech., 50370 Wroclaw, Poland) **Oznaczanie pozostalosci 1-(2′,4′- dwuchlorofenylo)-2- chlorowinylo fosforanu dwuetylowego (chlorfenwinfosu) w wodzie metoda chromatografii gazowej z detektorem rekombinacyjnym. [Determination of residues of diethyl 1-(2′,4′- dichlorophenyl)- 2-chlorvinyl phosphate (chlorfenvinphos) in water by gas chromatography with electron capture detector.]** *Chem. Anal. (Warsaw)* 21: 715-721; 1976. (9 references) (Polish)

A method for determining residues of chlorfenvinphos in water is described. Impurities were removed by a packed column, then the sample was extracted into benzene. Benzene extracts were concentrated to 1 ml, and the determination was made using gas liquid chromatography with electron capture detection based on the *trans*-isomer. A 0.2 ng detection limit was obtained at 12.8 min retention time using a 1 m x 3 mm packed column at 195°C and 45 ml/min flow rate. Chlorfenvinphos residues of 44 ng/l or more may be determined with a 94.2% recovery and a standard deviation of 2.4%.

78-1466. Kubiak, Z. ; Dabrowska, A. (Inst. Ind. Org. Chem., Warsaw, Poland) **Oznaczanie niektorych kwasow dwuchlorosalicylowych i dwuchlorofenoli w ich mieszaninie metodami miareczkowania w srodowisku niewodnym i chromatografii cienkowarstowowej. [Determination of some dichlorosalicylic acids and dichlorophenols in their mixtures by titration in non-aqueous medium and by thin-layer**

chromatography.] *Chem. Anal. (Warsaw)* 21: 723-729; 1976. (14 references) (Polish)

Potentiometric titration in a non-aqueous medium has been used to determine the total amount of 3,5- and 3,6-dichloro salicylic acids and the total 2,4- and 2,5- dichloro phenols in the presence of mineral acid. A mixture of dimethyl formamide and acetonitrile was used as preparatory medium, and 0.1 *M* methanolic potassium hydroxide was used for titration. This method can be used to determine dichloro phenol contents as small as 2%. TLC on plates coated with silica gel G was used for quantitative analysis of Dicamba. A mixture of chloroform, dioxan, and anhydroous acetic acid was used to develop chromatograms for qualitative analysis of Dicamba.

78-1467. Buser, H. R. ; Rappe, C. (Swiss Fed. Res. Stn., CH-8820 Wadenswil, Switzerland) **Identification of substitution patterns in polychlorinated dibenzo- *p*- dioxins (PCDDs) by mass spectrometry.** *Chemosphere* 7(2): 199-211; 1978. (12 references)

The PCDD's, a group of stable industrial contaminants, were examined to identify the isomers found in different products. Because only small amounts of the chemicals are available, mass spectroscopy was used to identify the various isomers. Chlorine substitution patterns were determined by close examination of the lower mass ions. Partial mass spectra for 34 PCDD's were presented. It was found that the mono-CDD's had two isomers, the di-CDD's 10, the tri-CDD's 14, the tetra-CDD's 22, the penta-CDD's 14, the hexa-CDD's 10, the hepta-CDD's 2, and octa-CDD 1. Fly ash samples from a municipal incinerator wer found to contain tetra-, penta-, hexa-, hepta-, and octa- CDD's which had been formed by pyrolysis of polychlorophenates. High resolution glass capillary columns were used in this identification, as well as mass spectroscopy. An industrial accident in Seveso, Italy, was responsible for PCDD's found in nearby soil. These were di-, tri-, and tetra-CDD's. Dechlorination of octa-CDD by UV photolysis in organic solvents consistently yielded lower CDD's in which the lateral chlorine atoms were lost. It is therefore unlikely that 2,3,7,8-tetra-CDD, which is extremely toxic, will be formed from pyrolysis of higher CDD's. Commercial PCP samples were found to contain hexa-, hepta-, and octa-CDD's.

78-1468. Pribyl, J. (Inst. Wasser. Boden. & Lufthyg., Bundesgesundheitsamt, D-1000 Berlin 33, Germany) **Trennung von Harstoff-Herbiziden und Chloranilinen mittels Hockdruck- Flussigchromatographie. [Separation of urea herbicides and chloranilines by HPLC.]** *Chromatographia* 10(12): 753-754; 1977. (4 references) (German)

It is possible to separate urea compounds from chloraniline, occurring often as metabolites of the former, by high-pressure liquid chromatography. Silica gel is used as stationary phase, and, depending on the kind of groups to be separated, various hexane:methylene chloride:ethanol mixtures are used as mobile phase. This isocratic elution is usually unfeasible in the case of urea herbicides associated with chloranilines of greatly varying polarity. In this case, the polarity of the mobile phase must be adjusted to that of the substances to be eluted.

78-1469. Warthen, J. D., Jr. ; Waters, R. M.; Voaden, D. J. (Biol. Active Nat. Prod. Lab., ARS USDA, Beltsville, MD 20705) **Separation of alkadien-1-ol acetate geometric isomers by capillary gas-liquid chromatography.** *Chromatographia* 10(12): 720-722; 1977. (31 references)

Gas-liquid chromatography with flame ionization detection was used to analyze alkadiene- 1-ol acetates, insect sex attractants which can be used as an insect control alternative. A support-coated open tubular column prepared with diethylene glycol succinate (liquid phase) was used. This column was useful in determining isomeric purity, which is an important consideration, since small quantities of other isomers may result in complete inactivation. Relative retention times were determined using tetradecanol acetate as the 1.00 standard. They reached as high as 3.82 for (E,E)-10,12- pentadecadien- 1-ol acetate.

78-1470. Kofanov, V. I. ; Kofman, I. Sh.; Baranov, Yu. S. (Inst. Colloid Chem. & Water Chem., Ukrainian SSR Acad. Sci., Kiev, USSR) **Isopol'zovanie termoionnogo detektora gazovogo khromatografa "Tsvet-106" dlya opredeleniya azotsoderzhashchikh pestitsidov. [Use of the thermionic detector of model "Tsvet-106" gas chromatograph for determining nitrogen-containing pesticides.]** *Gig. Sanit.* (2): 83-84; 1978. (Russian)

The suitability of flame-ionization detector for the GC determination of nitrogen-containing pesticides (atrazine, simazine and prometryne) was studied. The background voltage was 5-140 pA. Compared with metaphos, the sensitivity was considerably lower for the nitrogen-containing compounds; the coefficient of sensitivity was 0.64 for metaphos, vs 0.063 for prometryne, 0.076 for atrazine, and 0.082 for simazine. The linear range was 10^4, i.e., narrower than that obtained with flame-ionization detector (FID), but a linear relationship was found between the signal of the thermionic detector and the hydrogen flow rate. The thermionic detector is also highly insensitive to carbon- and nitrogen-containing coextracted substances. The findings indicate that thermionic detection is presently irreplaceable in the determination of nitrogen-containing pesticides.

78-1471. Pribyl, J. ; Herzel, F.; Schmidt, G. (Inst. Wasser. Boden. & Lufthyg., Bundesgesundheitsamt, D-1000 Berlin 33, Germany) **Beitrag zur Rueckstandsanalytik des Aminotriazols. [Contribution to the determination of aminotriazole residues.]** *Fresenius Z. Anal. Chem.* 289(2): 81-85; 1978. (6 references) (German)

The extraction behavior of the herbicide aminotriazole (amitrole) from soils and possibilities of its identification and quantitative determination by means of photometry, liquid and thin-layer chromatography are discussed. The dansylation of amitrole, several possibilities of its LC separa-

tion from other herbicides and typical UV and mass spectra are presented. (Author abstract by permission)

78-1472. Lawrence, J. F. (Food Res. Div., Health Prot. Branch, Tunney's Pasture, Ottawa, Ont. K1A OL2, Canada) **Evaluation of electrolytic conductivity detection for the gas chromatographic analysis of six polar organo nitrogen herbicides.** *Int. J. Environ. Anal. Chem.* 5(2): 95-101; 1978. (9 references)

A Coulson electrolytic conductivity detector (nitrogen mode) was used to detect chloramben, bentazon, bromoxynil, dinoseb, DNOC, and ioxynil in foods. Following acetone extraction and evaporation, the sample was treated with etheral diazomethane. A 2% deactivated Florisil column was used for cleanup before gas chromatographic analysis. Detectability, in terms of ng required to produce a 2 cm peak at 1 x attenuation, (60 v), was 8 ng for chloramben, 8 for bentazon, 9 for bromoxynil, 4 for dinoseb, 3 for DNOC, and 35 for ioxynil. When herbicide was added to foods at 0.1 and 1.0 ppm, 40 to 90% was removed by the extraction procedure.

78-1473. Gomez-Taylor, M. M. ; Kuehl, D.; Griffiths, P. R. (Dep. Chem., Ohio Univ., Athens, OH 45701) **Application of fourier transform infrared spectroscopy to the identification of trace organics in water.** *Int. J. Environ. Anal. Chem.* 5(2): 103-117; 1978. (12 references)

Dual-beam Fourier transform infrared spectroscopy has been used to identify pesticides and other organic water pollutants which have been separated by gas chromatography and high performance liquid chromatography. Neutral polystyrene resins were used to concentrate the contaminants, which were then eluted and chromatographed. Solutions containing 50 ppb of organochlorine pesticides could be analyzed by GC-IR. Recovery rates from 20-50 mesh XAD-2 at 2 ml solvent/min were determined for 100 ml of various eluting solvents. Recovery rates for aldrin ranged from 43% with hexane to 94% with diethyl ether; lindane, from 69% with hexane to 100% with diethyl ether; for DDD (TDE), from 74% with hexane to 93% with diethyl ether; for *p,p'*-DDT, from 69% with acetonitrile to 93% with diethyl ether; for perthane, from 71% with hexane to 96% with diethyl ether; for dieldrin, from 65% with hexane to 95% with diethyl ether; for heptachlor, from 59% with hexane to 87% with diethyl ether; and for hexachlorobenzene, from 65% with hexane to 89% with diethyl ether.

78-1474. Newsome, W. H. (Food Res. Div., Bur. Chem. Safety, Health Prot. Branch, Health & Welfare Canada, Tunney's Pasture, Ottawa, Ont. K1A 0L2, Canada) **A method for the determination of ethylenebis (isothiocyanate) on food crops.** *J. Agric. Food Chem.* 24(2): 420-421; 1976. (5 references)

A method was developed for the determination of ethylenebis (isothiocyanate) on food crops. The method is sensitive to 0.02 ppm and yields mean recoveries of 98% from 0.05 to 10 ppm of added residues. Interferences are not observed with either ethylenebis (dithiocarbamate) or ethylenethiuram monosulfide. (Author abstract reprinted by permission of the American Chemical Society)

78-1475. Cheng, H. H. ; Fuehr, F. (Dep. Agron. & Soils, Washington State Univ., Pullman, WA 99163) **Extraction of methabenzthiazuron from the soil.** *J. Agric. Food Chem.* 24(2): 421-424; 1976. (6 references)

A fourfold solvent extraction procedure involving the use of acetone-ethyl acetate and acetone-chloroform combinations was developed for quantitative extraction of the herbicide methabenzthiazuron (MBT) from the soil. The recovery of MBT from soils spiked with ^{14}C-MBT 1 day before extraction was consistently over 95%, with each of the first three extractions removing over 60% of the MBT present or remaining in the soil. After an MBT-treated soil was aged for 6 mo, only 50-70% of the ^{14}C remaining in the soil could be extracted. However, over 90% of the ^{14}C in the extracts was identified as the parent MBT, and the pattern of MBT removal from the aged samples was similar to that from spiked samples. It appears that the unextracted ^{14}C is either tightly bound by soil components or partially metabolized and could no longer be extracted by this procedure. (Author abstract reprinted by permission of the American Chemical Society)

78-1476. Loh, A. ; West, S. D.; Macy, T. D. (Agric. Anal. Chem., Lilly Res. Lab., Eli Lilly & Co., Greenfield, IN 46140) **Gas chromatographic analysis of tebuthiuron and its metabolites in grass, sugarcane, and sugarcane by-products.** *J. Agric. Food Chem.* 26(2): 410-413; 1978. (6 references)

Analytical procedures are described for determining residues of the herbicide tebuthiuron, *N*-[5-(1,1- dimethyl ethyl)-1,3,4- thiadiazol- 2-yl]-*N,N'*- dimethylurea, and its major metabolites in forage grass, sugarcane, and sugarcane by-products. Extracts of the plant tissue and sugarcane by-products are purified by liquid-liquid partitioning and alumina column chromatography. Measurement is accomplished by gas chromatography using flame photometric detection (GC-FPD) and by gas chromatography-mass spectrometry (GC-MS) using single ion detection. The methods are capable of determining 0.01-0.3 ppm the tebuthiuron and metabolites. (Author abstract reprinted by permission of the American Chemical Society)

78-1477. Muir, D. C. G. ; Baker, B. E. (Freshwater Inst., Dep. Fish. & Environ., Winnipeg, Manitoba R3T 2N6 Canada) **A method for the routine semi quantitative determination of hydroxy-s- triazines in soils.** *J. Agric. Food Chem.* 26(2): 420-424; 1978. (30 references)

A method is described for the routine, semi quantitative determination of several nonvolatile degradation products of the triazine herbicides atrazine, cyanazine, and cyprazine in soil samples. The procedure involves the extraction of soil samples with aqueous methanol and with a methanol-

hydrochloric acid mixture and the partition of the chloro- *s* - triazines into ethyl acetate. The aqueous extract which continued the hydroly-*s*- triazines was cleaned up by use of a column of cationic exchange resin; the hydroxy-*s*- triazines were converted to their methoxy derivatives by methylation with diazomethane. Gas chromagoraphic analysis was carried out by use of a Hall electrolytic conductivity detector (nitrogen mode). Recovery studies indicated that hydroxyatrazine [2-hydroxy- (ethylamino)- 6-(isopropyl amino)-*s*-triazine], hydroxy- cyprazine [2-hydroxy-4- (cyclopropyl amino)-6- (isopropyl amino)-*s*-- triazine], and cyanazine III [2-chloro-4- (1-carboxy-1- methyl ethylamino)-6-(ethylamino)-*s*- triazine] could be extracted more efficiently from fortified (37.8-790.0 μg/kg) soil samples than could *N* -dealkylated hydroxy-*s*- triazines. Overall recoveries of the hydroxy-*s*- triazines from soil were reduced by the poor efficiency of methylation to the corresponding methoxy-*s*- triazines. (Author abstract reprinted by permission of the American Chemical Society)

78-1478. Edgerton, T. R. ; Moseman, R. F. (Health Effects Res. Lab., US EPA, Research Triangle Park, NC 27711) **Electron-capture gas chromatographic determination of 2-*sec*-butyl- 4,6-dinitrophenol (DNBP) residues in feed, tissue, and excreta.** *J. Agric. Food Chem.* 26(2): 425-428; 1978. (7 references)

Gas chromatographic methods for determining the herbicide DNBP (2-*sec*-butyl- 4,6-dinitro phenol) in feed, blood, urine, feces, and tissues are presented. After extraction, the sample was reacted with diazo methane to produce the methyl ether of DNBP prior to analysis by electron-capture gas chromatography. An acid alumina column cleanup was developed to remove interferences from the sample extracts. Average recovery of greater than 85% were obtained from tissues, excreta, and feed fortified with known amounts of DNBP. Because of apparent binding or salt formation, methodology for freshly fortified and aged feed are also presented. Residue levels of DNBP from rats fed at two feeding levels are also presented. (Author abstract reprinted by permission of the American Chemical Society)

78-1479. Malaiyandi, M. (Environ. Health Cent., Health Prot. Branch, NHW, Tunney's Pasture, Ottawa, Ont K1A OL2, Canada) **Isolation of an enzyme inhibitor, 2-*sec*-butoxy-6,6-dichloro- 1,4-dioxolan- 5-one, from a formulation of trichlorfon.** *J. Agric. Food Chem.* 26(2): 429-434; 1978. (28 references)

The isolation of an enzyme- inhibiting substance from a commercial formulated product of trichlorfon using chromatographic techniques is described. The structure of this material is shown to be 2-*sec*-butoxy- 6,6-dichloro-1,4-dioxolan- 5-one by spectroscopic methods. A synthetic approach toward the formation of the enzyme inhibitor involving the adjuvants and impurities is proposed. (Author abstract reprinted by permission of the American Chemical Society)

78-1480. Archer, T. E. ; Stokes, J. D. (Dep. Environ. Toxicol., Univ. California, Davis, CA 95616) **Residue analysis of β-naphthoxy acetic acid and β- naphthol by high- pressure liquid chromatography.** *J. Agric. Food Chem.* 26(2): 452-455; 1978. (3 references)

A method is described for the rapid, accurate, and sensitive quantitative measurement of β-naphthoxy acetic acid and β-naphthol by high-resolution liquid chromatography. The method sensitivity is 0.05 ppm for both compounds. Recovery studies of β-naphthoxy acetic acid fortified in strawberries in concentrations ranging from 0.05 to 0.25 ppm averaged 90.4 ± 4.0%. Recovery studies of β- naphthol fortified in strawberries in concentrations ranging from 0.05 to 0.25 ppm averaged 93.8 ± 4.2%. The percent deviation of the chromatographic method was established for β- naphthoxy acetic acid by measurement of peak areas for concentrations of 1.5, 3.6, and 12 ng/20 μl sample loop as 6.3% deviation and for β- naphthol by measurement of peak areas for concentrations of 1.5, 3, and 6 ng/20 μl sample loop as 7.8% deviation. (Author abstract reprinted by permission of the American Chemical Society)

78-1481. Hurter, J. ; Manser, M.; Zimmerli, B. (Swiss Fed. Res. Stn., CH-8820 Wadenswil, Switzerland) **A rapid and simple method for the determination of residues of 2-chloroethyl phosphonic acid (ethephon) in tomatoes, cherries, and apples.** *J. Agric. Food Chem.* 26(2): 472-475; 1978. (19 references)

A rapid method has been developed for the detection of residues of 2-chloro ethyl phosphonic acid (ethephon) in tomatoes, cherries, and apples based upon degradation to ethylene at high pH values. The hormone released is determined by gas-solid chromatography. Extraction and purification of 2-chloro ethyl phosphonic acid from fruit tissue as described in earlier procedures can be omitted. Residue results are consistent with the direct identification of methylated ethephon by gas-liquid chromatography with a flame photometric detector. After a characteristic increase, maximum residues in field-treated crops were found to be 6.8 ppm on tomatoes, 4.1 ppm on cherries, and 1.2 ppm on apples 2 to 8 days after application. The natural content of ethylene in fruit is less than 5% of what can be expected from residues of ethephon. (Author abstract reprinted by permission of the American Chemical Society)

78-1482. Greenhalgh, R. ; King, R. R.; Marshall, W. D. (Chem. Biol. Res. Inst., Agric. Canada, Ottawa, Ont. K1A 0C6, Canada) **Trifluoro acetylation of pesticides and metabolites containing sulfoxide moiety for quantitation by gas chromatography and chemical confirmatory purposes.** *J. Agric. Food Chem.* 26(2): 475-480; 1978. (11 references)

The Pummerer reaction was evaluated as a means of derivatizing pesticides and their metabolites, which contain a S-O moiety for analysis by gas chromatography. Dasanit (fensulfothion), Dansanit oxon, and the sulfoxides of Mesurol (methiocarb), Nemacur (fenamiphos), and aldicarb all readily reacted with trifluoro acetic anhydride at RT/15 min to

give trifluoro acetoxy methyl sulfide analogues. For compounds possessing an NH moiety, more vigorous reaction conditions were required in order to form the di- trifluoro acetyl derivative as a single product in high yield. Oxydeneton- methyl, oxycarboxin, Couter (terbufos), and phorate sulfoxides also reacted with trifluoro acetic anhydride, but gave anomalous products. The secondary trifluoro acetoxy moiety of oxydemeton-methyl thermally decomposed on-column to give *cis* and *trans*-dehydrooxy demeton-methyl. Oxycarboxin underwent both an additive and transannular Pummerer reaction, depending on the reaction conditions, while phorate and Counter sulfoxides were transformed to their respective oxons. (Author abstract reprinted by permission of the American Chemical Society)

78-1483. Miles, J. W. ; Dale, W. E. (Vector Biol. Cont. Div., Bur. Trop. Dis., Cent. Dis. Cont., Public Health Serv., Atlanta, GA 30333) **Gas chromatographic determination of organophosphorus pesticides by in-block methylation.** *J. Agric. Food Chem.* 26(2): 480-482; 1978. (5 references)

Microgram quantities of selected organo phosphate, phosphoro thioate, and phosphoro diethioate pesticides were mixed with methanolic solutions of trimethyl anilinium hydroxide (TMAH) and injected into a gas chromatograph equipped with a phosphorus- sensitive flame photometric detector. The efficiency of the reaction of TMAH with the various pesticides was determined by measurement of the quantity of trialkyl phosphates formed. The efficiency of the in-block reaction in 0.01 *M* TMAH varied from 61% for phoxim to 100% for azinphos methyl. The rate of reaction of the pesticides with TMAH at ambient temperatures was also determined. Under these conditions the rate varied from 0% per day for malathion to 75% per day for chlorphoxim. The derivitization technique is useful for the identification and quantitation of many organophosphorus pesticides. (Author abstract reprinted by permission of the American Chemical Society)

78-1484. Mansour, M. ; Parlar, H.* (Inst. Okol. Chem., Ges. Strahlen. Umweltforsch. mbH Munchen, D-8051 Attaching, Germany) **Gas chromatographic determination of several cyclodiene insecticides in the presence of polychlorinated biphenyls by photo isomerization reactions.** *J. Agric. Food Chem.* 26(2): 483-486; 1978. (16 references)

The gas chromatographic determination of cyclodiene insecticides and their conversion products is often rendered difficult by the presence of PCB residues in environmental samples. This problem can be satisfactorily overcome by inducing photoisomerization reactions ($\lambda > 290$ nm) of some cyclodiene insecticides, thus producing the corresponding photoisomers in high yields. The photoisomers have longer retention times than their parent compounds and can therefore be identified and quantitatively determined by gas chromatography. The method can be improved by a subsequent UV irradiation of the sampls with wavelengths above 230 nm in methanol. This procedure yields photo dechlorinated products of the PCB's with shorter retention times but leaves the photoisomerization products of cyclodiene insecticides unaffected. (Author absract reprinted by permission of the American Chemical Society)

78-1485. Zehner, J. M. ; Simonaitis, R. A. (Stored Prod. Insects Res. & Dev. Lab., ARS, USDA, Savannah, GA 31403) **Gas chromatographic determination of hydrazoic acid.** *J. Chromatogr. Sci.* 14: 493-494; 1976.

The use of two gas chromatographs in the determination of sodium or potassium azide, an herbicide, is examined. A column of glass tubing packed with Porapak QS 80/100 mesh provided greater resolution between peaks. A higher temperature produced a higher sensitivity and allowed a more reproducible result. A second column of glass tubing, packed with 5% Carbowax 20 M terminated with terephthalic acid on 40/60 mesh Chromosorb T, produced similar results, but had a slightly lower sensitivity and reprodicibility. This method is applicable to aqueous solutions, air mixtures, and samples containing azide residues. The limits of detection were 1.5 ng, or 0.05% in aqueous solution (w/v), and 2 mg/l in air.

78-1486. Lawrence, J. F. (Food Res. Div., Bur. Chem. Safety, Health Prot. Branch, Dep. Natl. Health Welfare, Ottawa, Ont. K1A OL2, Canada) **A comarison of electron-capture GLC, electrolytic-conductivity GLC and UV-absorption HPLC for the analysis of some herbicides in foods.** *J. Chromatogr. Sci.* 14: 557-559; 1976. (4 references)

Gas chromatography with electron capture detection, gas chromatography with electrolytic- conductivity (nitrogen mode) deection, and high-pressure liquid chromatography with UV-absorption detection were compared for analyzing linuron, propanil, terbacil, benzoylprop- ethyl, and DCNA in foods. Cabbage, corn, potato, and wheat spiked at 2 and 0.2 ppm were analyzed. Before analysis the residues were extracted with acetone and partitioned into peroleum ether- methylene chloride. A 2% deactivated Florisil column was then used for cleanup. Gas-liquid chromatography with electron-capture detection was most appropriate for detecting DCNA and benzoylprop- ethyl. High-pressure liquid chromatography was preferable for terbacil because of its greater sensitivity. These two analytical methods gave similar results with linuron and propanil. Gas-liquid chromatography with electrolytic conductivity detection gave the smallest number of extraneous chromatographic peaks. All pesticides were detectable with this method at the 0.2 ppm level.

78-1487. Guilford, J. ; Hickman, E.; Ghosh, D. (Sch. Pharm., Texas Southern Univ., Houston, TX 77004) **A simple and sensitive gas-liquid chromatographic method for the determination of *o,p'*-DDD in biological fluids.** *J. Chromatogr.* 133: 218-221; 1977. (10 references)

A sensitive and specific gas-liquid chromatographic method for the determination of *o,p* -DDD in urine and whole blood is presented. For blood analysis water, hydrochloric acid, and diethyl ether were added to whole hepari-

nized blood, shaken, and then centrifuged. The organic phase was separated and extracted twice with sodium bicarbonate. The internal standard solution was added to diethyl ether solution, and the mixture was evaporated to dryness. The residue was dissolved in methanol and an aliquot was ingested into gas chromatography. Essentially the same procedure was follwed for urine samples. The recoveries from the rabbit blood and urine samples were consant in the range examined, with mean values of 80 and 93% for blood and urine, respectively. No interference from endogenous substances was noted.

78-1488. Kurhekar, M. P. ; D'Souza, F. C.; Meghal, S. K. (Reg. Forensic Sci. Lab., Maharashtra, Civil Lines, Nagpur, India) **Derivation of endrin, aldrin and dieldrin in biological material on thin-layer plates** *J. Chromatogr.* 147: 432-434; 1978. (7 references)

The use of thin layer chromatography for the derivatization of endrin, aldrin, and dieldrin, and the identification of both parent compound and derivative is described. Activated plates coated with 0.25 mm of a slurry of silica gel G and water (1:2) were spotted with 10 μg of the three compounds, and developed in a saturated chamber of hexane-acetone (4:1). Green fluorescence was observed under UV radiation, and treatment with the Schiff reagent gave a purple color. Preliminary cleanup is necessary only for material containing high levels of lipids. Endrin gave three spots with R *f* values of 0.78 (endrin), 0.36 (endrin ketone) and 0.56 (endrin aldehyde). Dieldrin gave three spots with R*f* values of 0.73 (dieldrin), 0.39 (dieldrin ketone), and 0.61 (unidentified). Aldrin gave one spot with an R*f* value of 0.92. The method was sensitive to 5 μg of pesticide.

78-1489. Bong, R. L. (FDA, Minneapolis, MN 55401) **Determination of hexachlorobenzene and mirex in fatty products.** *J. Assoc. Off. Anal. Chem.* 58(3): 557-561; 1975. (11 references)

A procedure is described for the isolation and cleanup of hexachloro benzene (HCB) and mirex in fats and oils for gas-liquid chromatographic (GLC) analysis. The fat or oil is distributed on unactivated Florisil, and the HCB and mirex are eluted with acetonitrile. The pesticides are then partitioned into petroleum ether. Elution through activated Florisil with methylene chloride :hexane (20:80) is used for the final cleanup. HCB and mirex are then measured by GLC, using appropriate electron capture conditions with a 15% OV-210 column for HCB and a 3% OV-101 column for mirex. The method demonstrates recoveries greater than 90% for HCB and mirex and allows screening at or below the 0.1 ppm level in fats with a 3 mg fat injection. (Author abstract by permission)

78-1490. Sundstrom, G. ; Hutzinger, O.; Karasek, F. W.; Michnowicz, J. (Lab. Environ. Chem., Univ. Amsterdam, Amsterdam, The Netherlands) **Environmental chemistry of substitutes for poly chlorinated biphenyls. I. Composition and properties of an alkyl chloro biphenyl product.** *J. Assoc. Off. Anal. Chem.* 59(5): 982-988; 1976. (12 references)

The composition of a technical alkylchloro- biphenyl mixture, proposed as a substitute for poly chlorinated biphenyls, has been investigated by spectral and chromatographic methods. Gas-liquid chromatography mass spectrometry revealed the presence of a large number of biphenyls substituted with 2 to 3 chlorine atoms and 0 to 4 isopropyl groups. The mixture was dechlorinated as a first step toward structure elucidation of the individual components. The behavior of the alkylchloro biphenyls during analytical cleanup steps such as thin layer chromatography and chromic acid oxidation was also investigated. (Author abstract by permission)

78-1491. Ernst, G. F. ; Anderegg, J. P. T. (Food Insp. Serv., Utrecht, The Netherlands) **Rapid gas-liquid chromatographic method for determining residues of ethephon (2-chloroethyl phosphonic acid) in tomatoes.** *J. Assoc. Off. Anal. Chem.* 59(5): 1185-1187; 1976. (2 references)

A rapid method is described for the determination of the growth regulator ethephon (2-chloro ethyl phosphonic acid) in tomatoes. Samples are extracted with ethyl acetate. The extract is methylated, decolorized with carbon, and analyzed by gas-liquid chromatography on a column paced with 15% QF-1/10% DC-200 on Chromosorb W (HP). A flame photometric detector is used. Recoveries from tomatoes fortified with 0.1-11.0 ppm ethephon were 78-98%. The sensitivity of this method is about 0.1 ppm. (Author abstract by permission)

78-1492. Bascom, W. (Southern California Coastal Water Res. Proj., El Segundo, CA) **Instruments for studying ocean pollution.** *J. Environ. Eng. Div. Am. Soc. Civ. Eng.* 103: 1-8; 1977.

Sampling and measuring instruments for studying pollution in coastal waters are described. Measuring pesticides at a few parts per trillion requires extreme care. Methods are described for measuring uptake of pollutants by marine animals, aerial fallout of DDT on the water surface, and motion of water masses. Fallout from the atmosphere is the route by which a proportion of pesticides reach the ocean in some locations. To obtain an approximate measurement of DDT fallout, glass plates coated with mineral oil are placed horizontally on coastal rooftops at locations away from possible contaminants. The mineral oil traps chlorinated hydrocarbons in the dry aerial fallout. It is collected weekly, after which it is extracted with hexane and analyzed by gas chromatography. Pump and tube samplers, sampling bottles, sediment and floatable collectors, and bottom samplers are also used in determining chemical characteristics of impurities in water, particles, and sediments. Cages of mussels at specific depths atached to a buoy can be used to study the uptake of pollutants by animals. [At the 1976 ASCE National Water Resources and Ocean Engineering Convention.]

78-1493. Schmid, E. R. ; Damboritz, W.; Markl, P. (Inst. Anal. Chem., Univ. Wien, Wien A-1090, Austria) **Radiomet-**

rische Bestimmung von 11 Carbamatpestiziden im Nanogramm- und Subnanogrammbereich mittels Cholinesterasehemmung. [Radiometric determination of 11 carbamate pesticides in the nanogram and subnanogram ranges by means of cholinesterase inhibition.] *Nahrung* 21(4): 311-317; 1977. (11 references) (German)

A method for determining carbamates based on inhibition of acetyl cholinesterase activity was developed. Radioactively labeled acetylcholine was used as a substrate, and the ^{14}C-acetic acid formed by hydrolysis was extracted and measured. Very small amounts of carbamates were detected. Aldicarb, Baygon (propoxur), benomyl, Bux (bufencarb), carbaryl, CIPC (chlopropham), Matacil (aminocarb), phenmedipham, and promecarb were detectable in the picogram range. Barban and methomyl were detected in the nanogram range. The curves obtained were linear between 0.001 and 10 ng. The sensitivity, in terms of ratio of percentage change in inhibition to change in lg/ng carbamate, ranged from 1.0 to 9.7.

78-1494. Heller, J. M. (Army Environ. Hyg. Agency, Aberdeen Proving Ground, MD) **Extraction and separation of polychlorinated biphenyls from pesticide monitoring samples.** *Natl. Tech. Inf. Serv.* AD-A011,242: 9p.; 1975.

A new method was tested for the removal of polychlorinated biphenyls (PCB's) from biological samples. These industrial chemicals are ubiquitous in biological samples such as fish and bird adipose tissue. Based on retention characteristics they can easily be misidentified as organochlorine pesticides. The PCB's are partially or completely recovered from a Florisil column using the multiresidue methodology for organochlorine pesticides. A silic acid column was spiked with a solution of 4 PCB's and 11 insecticides. Performance of the method was judged by percent recovery of pesticides along with their complete separation from the PCB's and *p,p*-DDE. The method performed well with respect to the above mentioned criteria and has been incorporated into the Department of the Army Pesticide Monitoring Program for the routine separation of PCB's from pesticides in biological samples.(Author absract by permission)

78-1495. Thomas, T. C. ; Jackson, J. W. (Environ. Health Lab., McClellan AFB, CA) **An evaluation of a commercial instrument for chlordane and heptachlor sampling.** *Natl. Tech. Inf. Serv.* AD-A020,337/2GA; 1975.

A commercial pesticide sampler was evaluated for chlordane and heptachlor sampling. The sampler can obtain samples at rates up to 6.5 CFM through each of two collectors. Collectors are glass fiber filters impregnated with a polymeric medium. Chlordane and heptachlor appear to be collected by several modes: filtration, adsorption, diffusion and gas-solid partioning. Analyses showed that the compounds were collected efficiently on the collector and retained. A detection level of approximately 20 ppt can be obtained with a 1 hr sample. The sampler is flexible and quite easy to use. Several problems are associated with operation of the sampler. Suggested improvements are discussed in the report. Suggestions for further work are also included. (Author abstract by permission)

78-1496. Pickles, F. J. (Dep. Chem., Rhode Island Univ., Kingston, RI) **Crystal structure analysis of selected pesticides by single crystal x-ray diffraction: The crystal and molecular structure of padan.** *Natl. Tech. Inf. Serv.* PB-268,579: 46p.; 1975. (33 references)

The solution of the crystal and molecular structure of Padan (cartap) by single crystal x-ray diffraction confirmed that the compound under investigation is 1,3-*bis* (thio carbamoyl)-2-*N,N*- dimethyl amino- propane hydro chloride. The results show that the structure of Padan is very similar to that of acetylcholine. This similarity suggests that the toxicity of this insecticide may be due to its activity in cholinergic systems. (Author abstract by permission)

78-1497. Thruston, A. D., Jr. (Anal. Chem. Branch., Environ. Res. Lab., Athens, GA) **A quantitative method for toxaphene by GC-CI-MS specific ion monitoring.** *Natl. Tech. Inf. Serv.* PB-251,931: 28P.; 1976. (9 references)

A method was developed for the identification and quantification of toxaphene using a Specific Ion Monitoring (SIM) program with GC-CI-MS. Interferences from DDT's and Arochlor 1260 are eliminated or minimized. GC-CI-MS was also used to distinguish toxaphene from strobane. (Author abstract by permission)

78-1498. Khan, N. ; Masud, Z.; Osmani, J. A.; Zakai, T.; Baig, M. M. H. (Agric. Res. Counc., Malir Halt, Karachi 27, Pakistan) **A comparative study of analysis of technical grade fenitrothion by three different techniques.** *Pak. J. Sci. Ind. Res.* 19(2): 97-98; 1976. (5 references)

Gas liquid chromatography, IR spectrophotometry, and the chemical method recommended by the WHO were compared for fenitrothion analysis. The chemical method makes use of a diazonium reaction, and is time-consuming. The gas liquid chromatography determination used electron capture detection, and the limit of detection was 0.02 to 0.04 μg. When five fenitrothion samples were analyzed, the three methods indicated that the first was 97.5 to 98.1% fenitrothion, the second was 96.98 to 101.15% fenitrothion, the third was 96.72 to 101.75% fenitrothion; the fourth was 97.65 to 100.23% fenitrothion, and the fifth was 97.4 to 101.15% fenitrothion. Gas liquid chromatography gave the highest reading three times and the lowest twice. IR spectrophotometry gave the lowest reading twice and the highest reading once.

78-1499. Smith, A. E. (Res. Stn., Agric. Canada, Regina, Sask. S4P 3A2, Canada) **Comparison of solvent systems for exracting herbicide residues from weathered field soils.** *Pestic. Sci.* 9(1): 7-11; 1978. (16 references)

The extraction from several field soils of the four herbicides benzoylprop-ethyl, nitrofen, profluralin, and tri-allate applied at least 6 mo previously was compared using six sol-

vent systems. The residues extracted were quantified using GC techniques. Similar recoveries were achieved using 30% aqueous acetonitrile or acetonitrile ± water ± glacial acetic acid mixtures. The presence of the acetic acid was found to increase residues extracted only in the case of tri-allate. Methanol and 10% aqueous acetonitrile were slightly less efficient in recovering residues from the weathered field soils whereas acetone tended to be a poor solvent for the extraction of the chemicals studied. (Author abstract by permission)

78-1500. Sobina, N. A. ; Kheifets, L. Y.; Ramanov, N. A. (All-Union Sci. Res. Inst. Water Prot., Kharkov, USSR) **Raznostnoe ostsillo polyaro graficheskoe opredelenie metafosa i geksa khlortsiklo geksana v vode. [Differential oscillo polaro graphic determination of metafos and hexachloro cyclohexane in water.]** *Zh. Anal. Khim.* 33(1): 137-141; 1978. (6 references) (Russian)

A differential oscillo polaro graphic method was developed for determining metaphos (methyl parathion) and BHC in river water. The oscillo polarograph consisted of two electrolytic cells, one for the water sample to be analyzed, the other for a similar reference solution (residue-free water or the same sample with benzene). The method was found suitable for the determination of metaphos and BHC in natural waters and other liquids. The lowest limit of sensivitity was 4.2 n*M* for metaphos, and 0.34 n*M* for BHC.

See also **78-1241**, **78-1260**, **78-1272**, **78-1314**, **78-1315** *and* **78-1328**.

PESTICIDES ABSTRACTS

QUARTERLY INDEX

April–June 1978 Vol. 11 Nos. 4-6

PREFACE

The basic design for this index was supplied by the Technical Services Division, Office of Pesticide Programs, Environmental Protection Agency. It consists of two subject indexes (concept and compound) and two author indexes (personal and corporate). Primary and secondary headings in the Concept Index appear as subordinate headings in the Compound Index, both indexes having three levels of specificity.

In the Concept Index, only general aspects are indexed under the broader terms shown below. For specific terms, the reader should consult the appropriate heading in the Concept Index, selecting the narrower term that best fits his need.

Compounds are indexed by their common names; where other compound designations are used by authors, these synonyms appear with the notation to *see* the common name. Articles referring, in general, to structural or functional chemical classes are indexed under the broader headings (e.g., organochlorines, herbicides, etc).

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